MAY, 1954

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

T.P.

1934 · 1954 20th ANNIVERSARY YEAR

- How to Determine Quality Capability of Machine Tools
- Tool Grinding Can Be Stealing Your Dollars
- Increase Production on Your Automatic Screw Machine
- Your Turret Lathes Deserve the Best Preventive Maintenance
- Nitriding vs. Shot Peening
- Matched-Die Molding of Reinforced Thermoplastics
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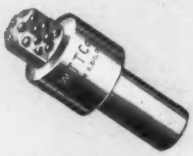

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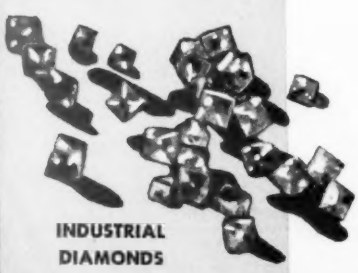

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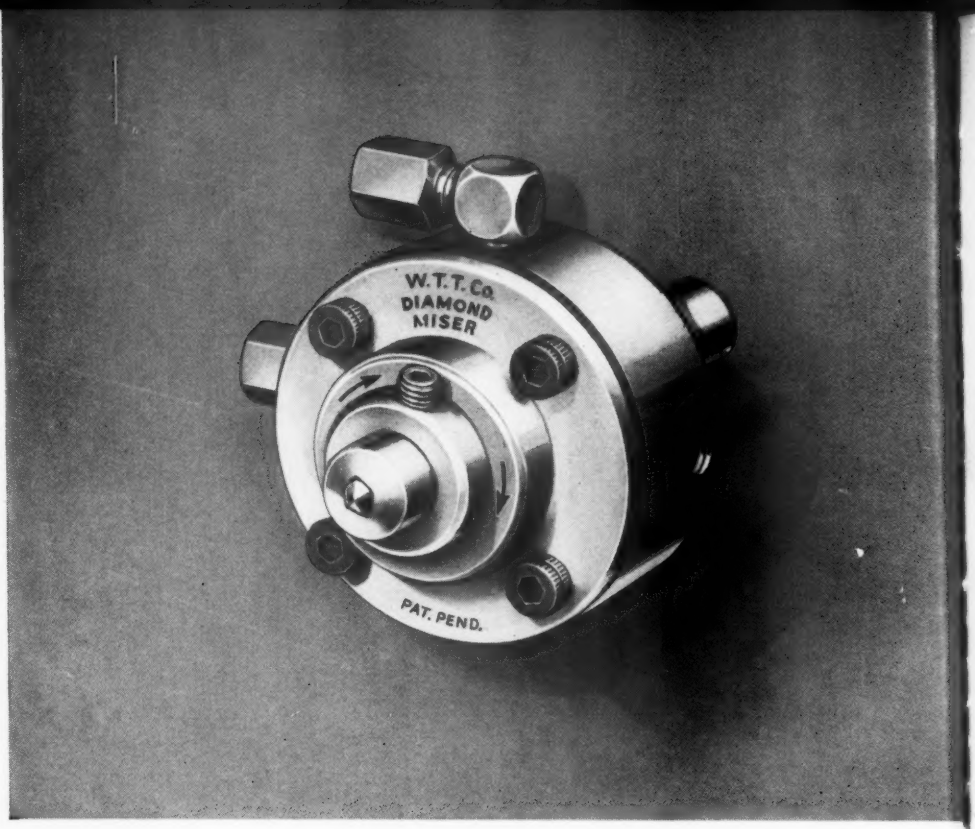

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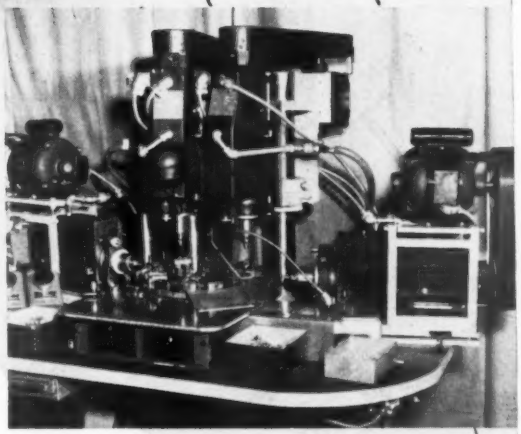

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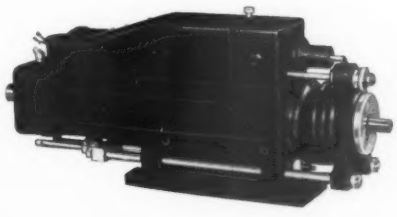

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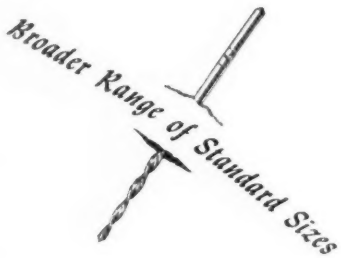

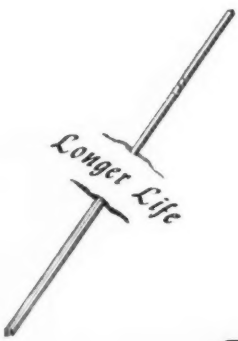

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TOOL & DIE JOURNAL 1941-51

VOL. XX—No. 2 MAY, 1954

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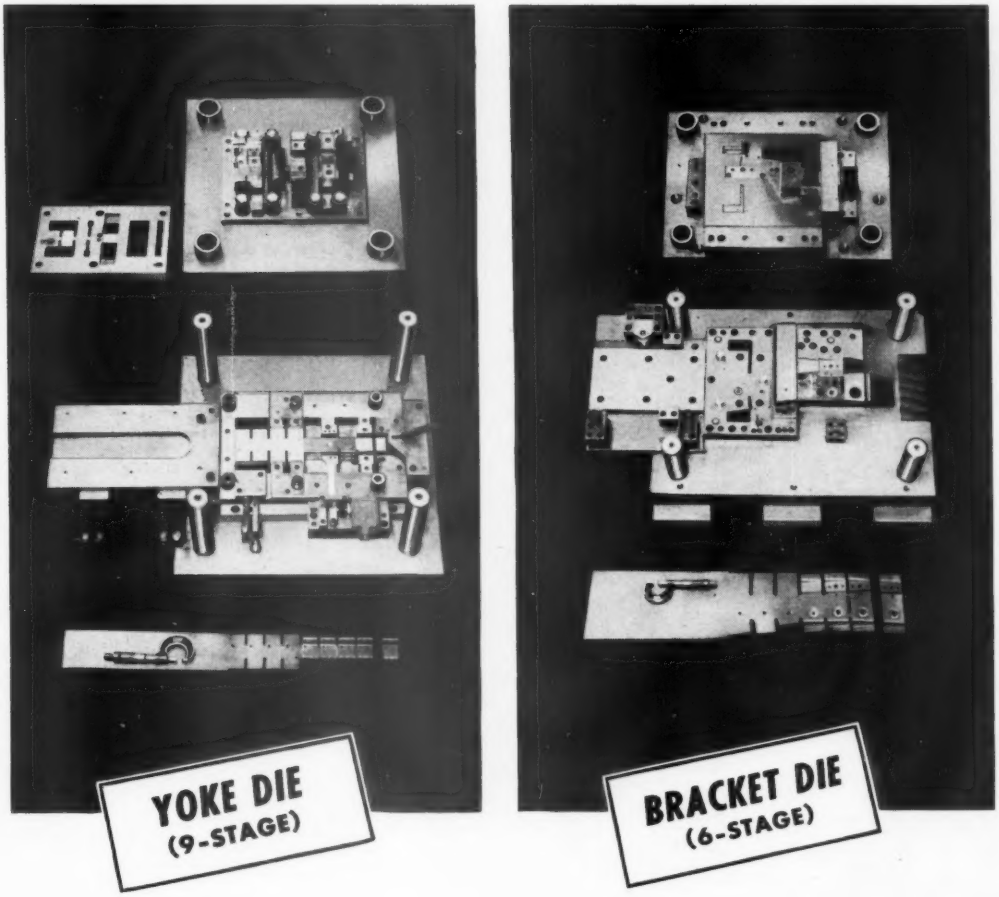

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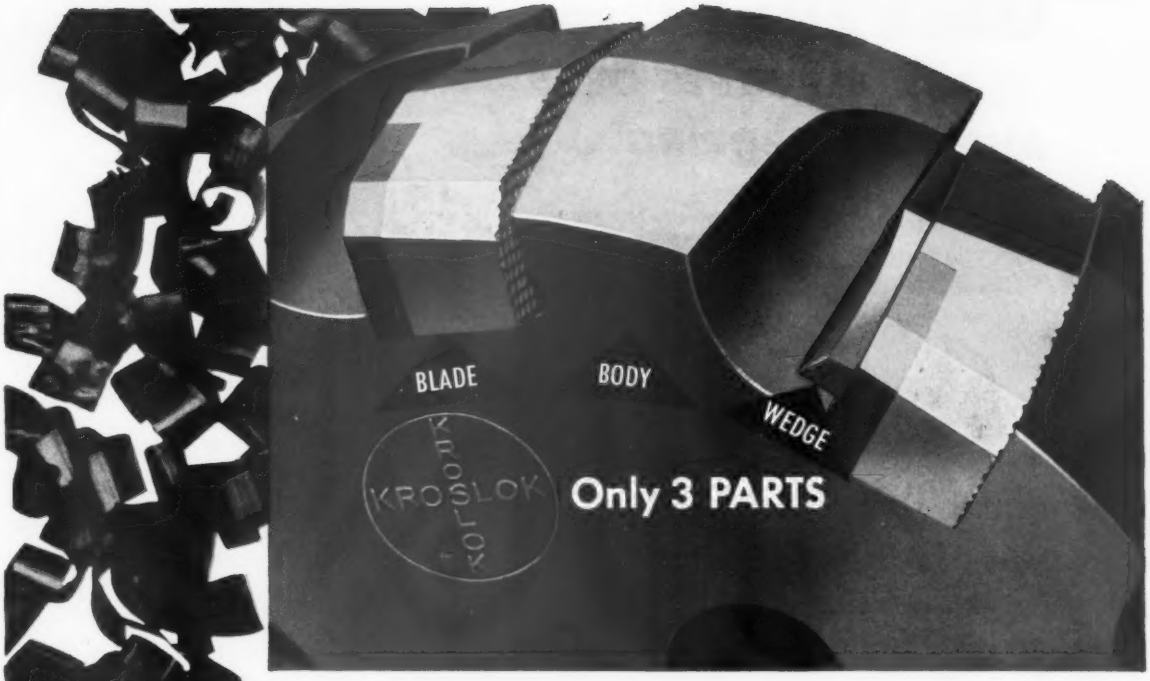

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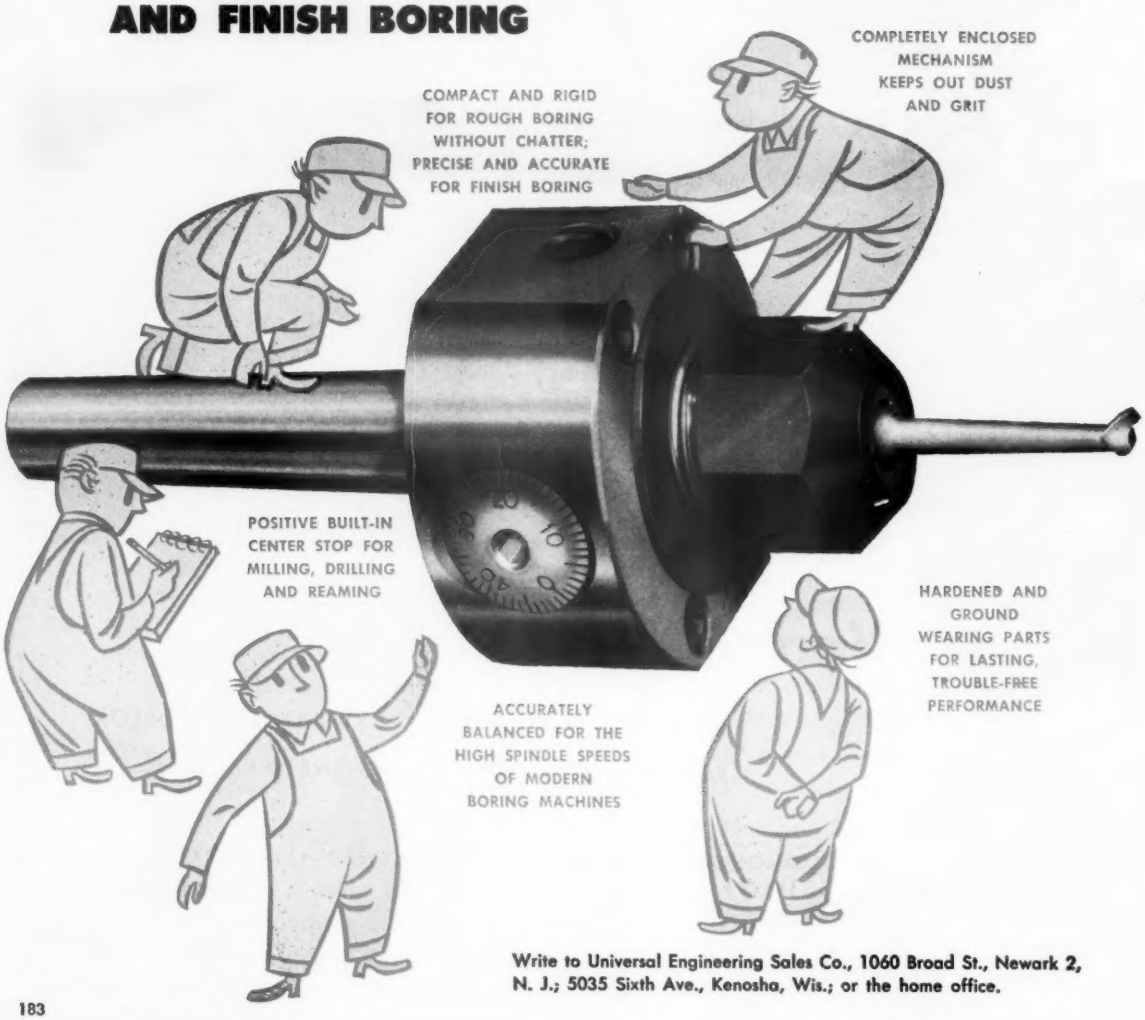
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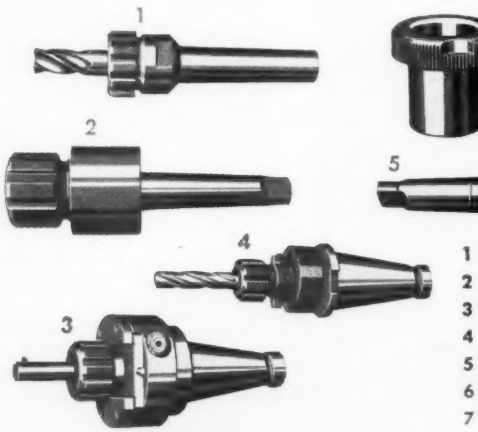

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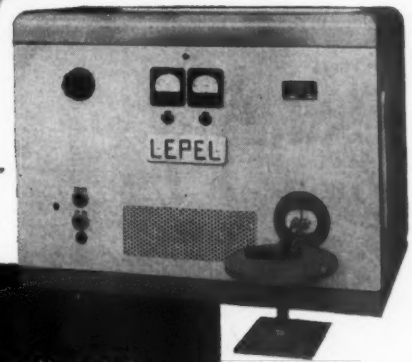

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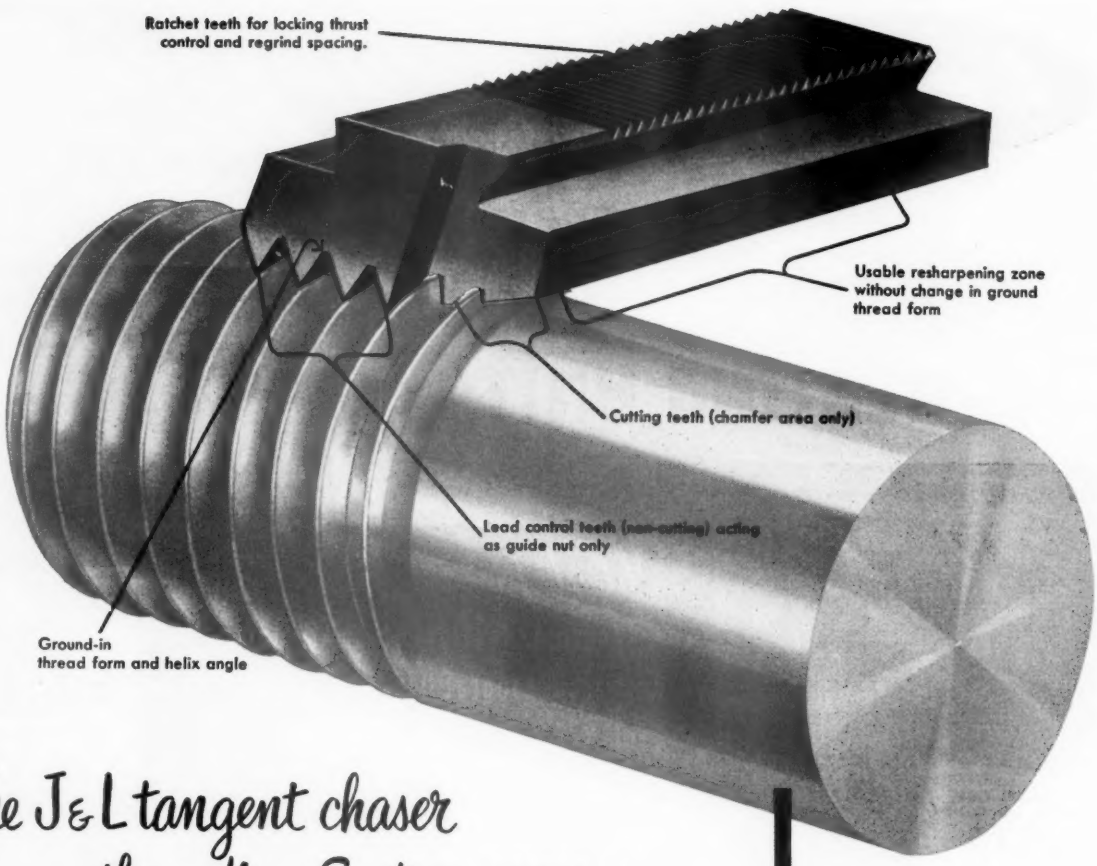
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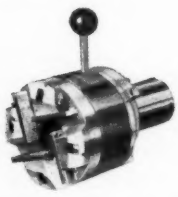

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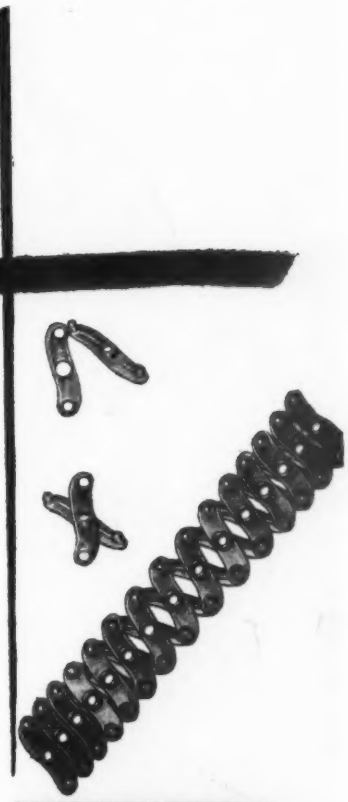
with

PRODUCTO *Catalog* DIE SETS



Economy, at no sacrifice of production speed or quality, is the keynote of this Producto case history, which shows how the Benrus Watch Co., Inc., Waterbury, Connecticut, cut their stamping costs in the production of wrist watch "X-type" expansion bracelets. The secret, according to Benrus, lay in converting a Producto 2-pin catalog die set into a 4-pin die set suitable for this precise link stamping job. The conversion, which was quickly and easily made, gave Benrus a small, compact, and carefully balanced die set that lined up properly and permitted a unilateral load and vertical punch, with no problem of "winking." As a result, Benrus has been able to maintain consistently high-quality, high-speed stamping with extremely low per-hour and per-grind costs. Rejects have been reduced to an absolute minimum. The specifications below tell the complete story.

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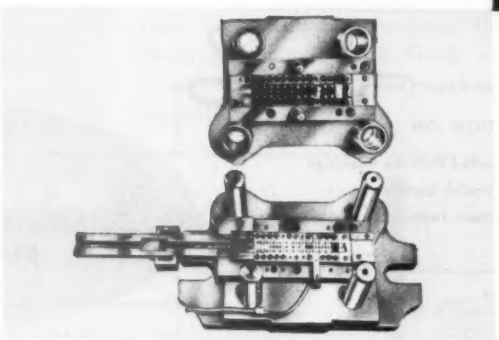
STAMPINGS: Top and bottom links (or liner parts) supporting outer shells.
MATERIALS — TOP LINK: Type 430 steel, dead soft, bright finish.
BOTTOM LINK: 85-15 rich low brass, dead soft.
TOLERANCE: Hole Locations — Both top and bottom ± .0005".
THICKNESS: Top — .018" Bottom — 030".
STATIONS: Top — 3. Bottom — 10.
PRODUCTION: Top — 6,000 pieces per hour. 50,000 pieces per grind.
Bottom — 6,000 pieces per hour. 75,000 pieces per grind.
OPERATIONS: Top — Pierce, pilot, blank.
Bottom — 6 draws, pierce, swedge, pilot, blank.

This special watchmaker die set, made by Producto to Benrus specifications, was used for stamping top links.



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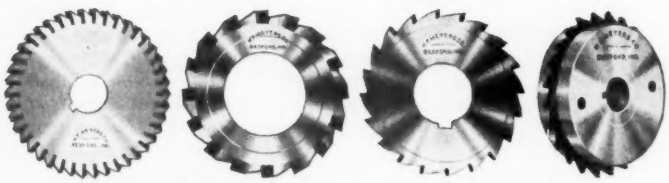

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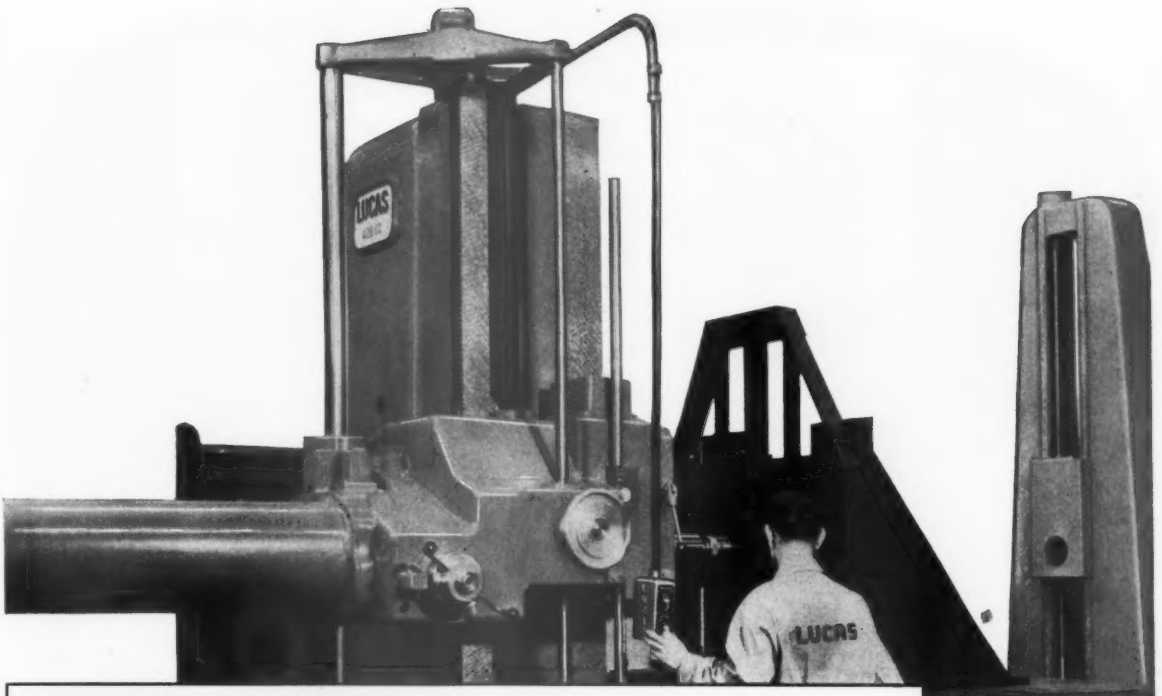
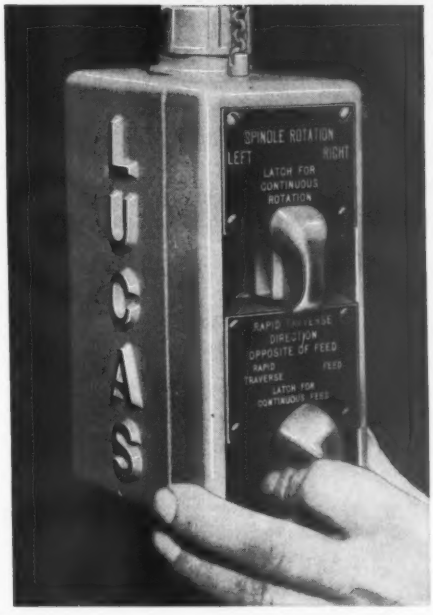




Here is the new, lightweight, swing-about pendant control on the Lucas horizontal boring machine. This flexible control places at the operator's finger tips, over the entire working area about the machine, START, STOP, JOG (forward and reverse) of the spindle rotation, and START, STOP, INCH and RAPID TRAVERSE of all unit motions.

Two smooth operating switch levers in this small-dimension pendant do the work of ten control buttons. The position of the levers gives quick visual indication of engagement and direction. One of many features that is keeping Lucas out in front among horizontal boring, drilling and milling machines.

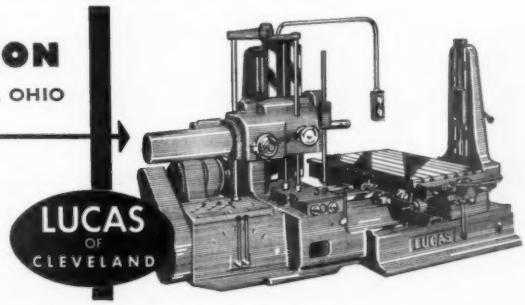
THE LUCAS MACHINE DIVISION

THE NEW BRITAIN MACHINE COMPANY • CLEVELAND 8, OHIO

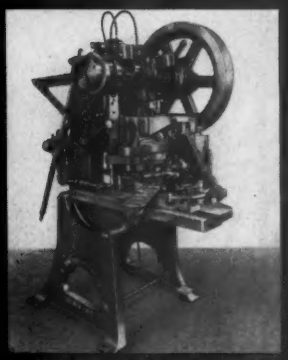
. . . Machines for Making Progress

Lucas Horizontal Boring, Drilling and Milling Machines

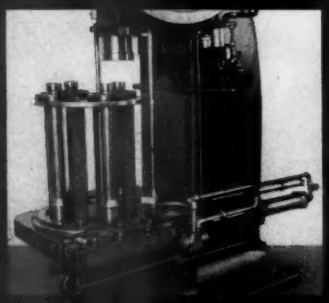
Our general catalog is filed in the Sweet's Machine Tool Catalog File.



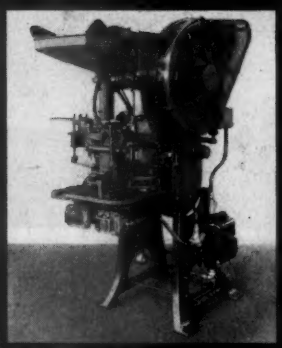
CIRCLE INFORM-A-GRAM KEY NO. 15



V & O has the sturdiness that makes automation practical.



V & O can provide the working height that automation may need.



V & O has the precision that is fundamental to automation.

If made on a standardized assembly line, the mere changing of a few bolt sizes can cause a press to become a "special job." But if made in the V & O shop the most extraordinary of press automation features are just part of the day's work.

V & O was started, 65 years ago, to eliminate the problems of automated press tooling. Our long slide principle, the greatest boon to press automation, was built into the first press we ever made. We have lived with automation, worked with automation, dreamed out the answers to automation problems, for all those years. And there is no such thing as an automated press that does not have special features.

When you have a production problem that can be solved by automated tooling, automated feeds, higher precision tool motions, or tools whose lives depend upon the precision with which the press operates, take it up with V & O.

When you want the press that will be easiest for your own tool makers to automate, be sure that you get a V & O.

Our representative would like to tell you more about the press that is built like a high grade machine tool. Write us, please.

HOW SPECIAL IS A "SPECIAL" MACHINE?

THE V & O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

HUDSON, NEW YORK

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

65th Anniversary

WHY THE V & O LONG SLIDE PROVIDES BETTER ALIGNMENT

With the same running clearance, the longer the slide the less the possibility for angular misalignment. And we keep our running clearances very close indeed.

CIRCLE INFORM-A-GRAM KEY NO. 16

Microbore

STANDARD BORING BAR SETS

for use on all Makes and Types of Boring and Milling Machines

Discuss your tooling problems with our Microbore specialists

Standard Microbore Boring Bar Sets are available in a wide range of sizes with Morse Taper or Milling Machine Taper Shanks.

Send for new illustrated Catalog.

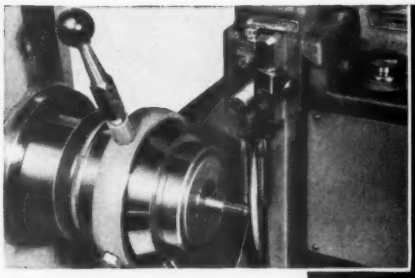
DE VLIEG MICROBORE COMPANY

480 Fair Avenue, Ferndale • Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 17

Rotating or non-rotating

Levermatic COLLET CHUCK performs equally well!



Accuracy obtained on this thread grinding operation eliminated need of holding between centers.

Tapping to extremely close tolerances on a difficult job.

All users are unanimous in reporting the all-purpose value of the Levermatic. Not only is it *accurate* and *fast*, but it is exceedingly *versatile*. In fact, jobs that are turned or faced can be threaded or milled without removal from the chuck.

The Levermatic provides *instant* internal and external gripping and releasing (with no stopping of spindle on bar or arbor work)! Faster, more accurate machining at lower costs! For every type of standard and special machine.

Send for Catalog

Learn how practical the Levermatic would be in your shop by seeing how other users have applied it to their jobs.

SUTTON TOOL COMPANY
Dept. TP-5, Sturgis, Michigan
Send Free Copy of Sutton Levermatic Chuck Catalog.

Company_____

Name_____ Title_____

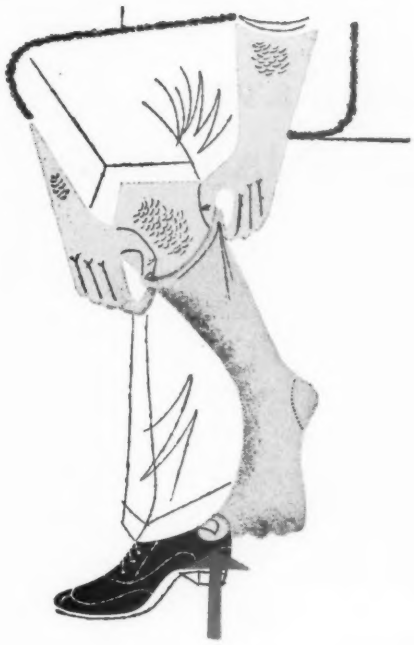
Address_____

City_____ State_____

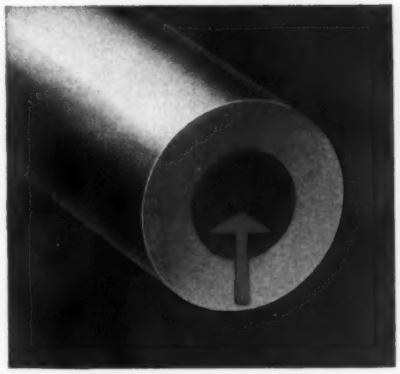
RUNS AS TRUE AS THE SPINDLE

Sutton Tool Company
STURGIS, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 18



a hole here is a nuisance...



a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon—high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW TOOL STEEL**

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 19

Check These Time-Saving, Money-Saving Advantages . . .

Swartz Drill Jigs and Fixture Locks

1. SPEED TOOLING because you are in production immediately with a Swartz fixture.

2. ACCURACY built into every fixture which means a precision operation in your shop.

3. INTERCHANGEABLE which makes them usable on a multitude of jobs.

There's a Swartz man near you

Swartz

TOOL PRODUCTS

All Types of Shop Production Tools

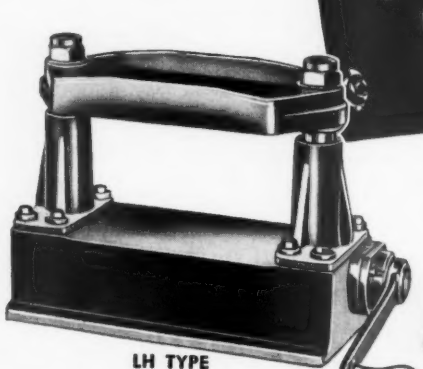
Division of Jefferson Corporation • 13330 Foley Ave., Detroit 27, Mich.
Tel. WE 3-1552

5 LOCK SIZES

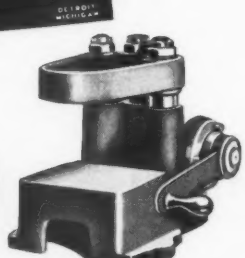
WRITE FOR **NEW** CATALOG 953

Fixtures ready when you need them from Dealer stocks

LO TYPE



LH TYPE



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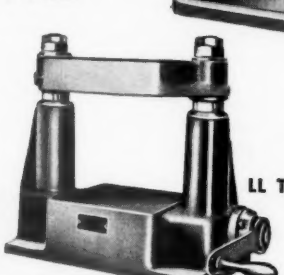


LL TYPE

Use Our Engineering Service!

CIRCLE INFORM-A-GRAM KEY NO. 20

Finished with Diamond... ELGIN Diamond!

... IN DYMO-C FOR CARBIDES AND DYMO FOR OTHER HARD MATERIALS

From bearing races to precision hydraulic parts—from wear inserts to wire dies . . . wherever fine finish means better performance . . . you can be certain of the best with Elgin Diamond. Crushed, precision graded and combined with an exclusive color identified vehicle in DYMO, it cuts faster and assures uniform predictable results. Write today for complete information and remember, where they're particular about finish, they . . .

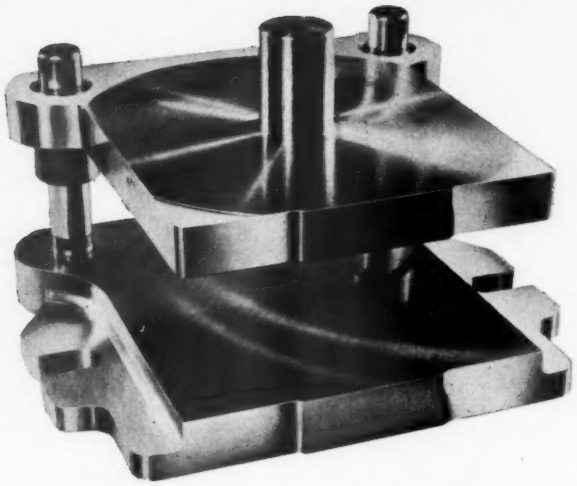
Finish with Diamond... ELGIN Diamond!

ABRASIVES DIVISION

ELGIN NATIONAL WATCH COMPANY

Elgin, Illinois

SEND FOR FREE BOOKLET



DANLY'S IN THE PICTURE

at Eastman Kodak Company

Danly Die Sets play an important role in the manufacture of Eastman's popular new Brownie movie camera and Brownie movie projectors . . . latest in the Eastman line that Danly Die Sets have helped build all through the years. Used to mount high precision dies, Danly Die Sets help bring "master die" accuracy to every finished part. But Danly Die Sets do more . . . even before a press run ever starts. They make tooling-up easier, faster—save you many, many hours in the die shop. And once in production, these same Danly Die Sets do their share to maintain non-stop production . . . save down-time . . . increase die life. And remember, Danly Die Set service is as quick and convenient as a phone call.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

DANLY

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

PICK THE DANLY BRANCH NEAREST YOU!

***CHICAGO** 50	2100 S. Laramie Avenue
***CLEVELAND** 14	1550 East 33rd Street
***DAYTON** 7	3196 Delphos Avenue
***DETROIT** 16	1549 Temple Avenue
***GRAND RAPIDS**	113 Michigan Street, N.W.
INDIANAPOLIS 4	5 West 10th Street
***LONG ISLAND CITY**	47-28 37th Street
***LOS ANGELES** 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 E. Wisconsin Avenue
***PHILADELPHIA** 40	511 W. Courtland Street
***ROCHESTER** 6	33 Rutter Street

**Indicates complete stock.*

VERSATILITY +
ACCURACY +
ECONOMY +

another great new PLUS... The CLAUSING VERTICAL MILLER

is NOW READY FOR YOU!

For versatility, accuracy and economy, the new Clausing Vertical Milling Machine has more Plus Value features than have ever before been available in a miller at or near its price!

It has Versatility Plus! Especially designed for tool room, pattern shop and general purpose use, it is actually several machines combined in one. The spindle head can be swiveled in a vertical plane and set at any angle, and turret rotated in a horizontal plane making it possible to mill, drill, bore, ream and shape at all angles, with one setup.

It has Accuracy Plus! The heart of the Clausing Mill is its rigid, high precision spindle head. It has 7 ball bearings — spindle is chrome nickel steel, hardened and ground — quill, hardened and ground, has honed bearing seats — overarm is rigid steel casting, with ¾" thick walls precision ground — drive has 4 ball bearings.

Quill has micrometer depth control stop and two feeds; rack controlled by lever for sensitive feed and gear controlled by hand wheel for fine feed. All feed screws have ground threads, turn on ball bearings, have large micrometer dials.

Table surfaces and dovetail ways on table, saddle, knee and column are precision ground.

It has Economy Plus! The Clausing has many features that reduce setup and operating costs in both tool room and production milling. It's low in initial investment, and careful selection of materials and precision workmanship assure long service.

Write today for the complete story of this sensational new machine tool!

CONDENSED SPECIFICATIONS

Size of Table	6" x 24"
Longitudinal Table Travel	15"
Transverse Table Travel	5"
Vertical Travel of Knee	12"
Maximum Distance Spindle to Table	12"
Maximum Distance Spindle to Column	8¾"
Quill Travel	3"

Spindle Speeds: Six, 180 to 3250 R.P.M.
No. 7 Brown and Sharpe or No. 2 Morse Taper Spindle Optional
Operates from ½ or ¾ HP, 1725 R.P.M. Motor

WRITE FOR ILLUSTRATED LITERATURE TODAY!

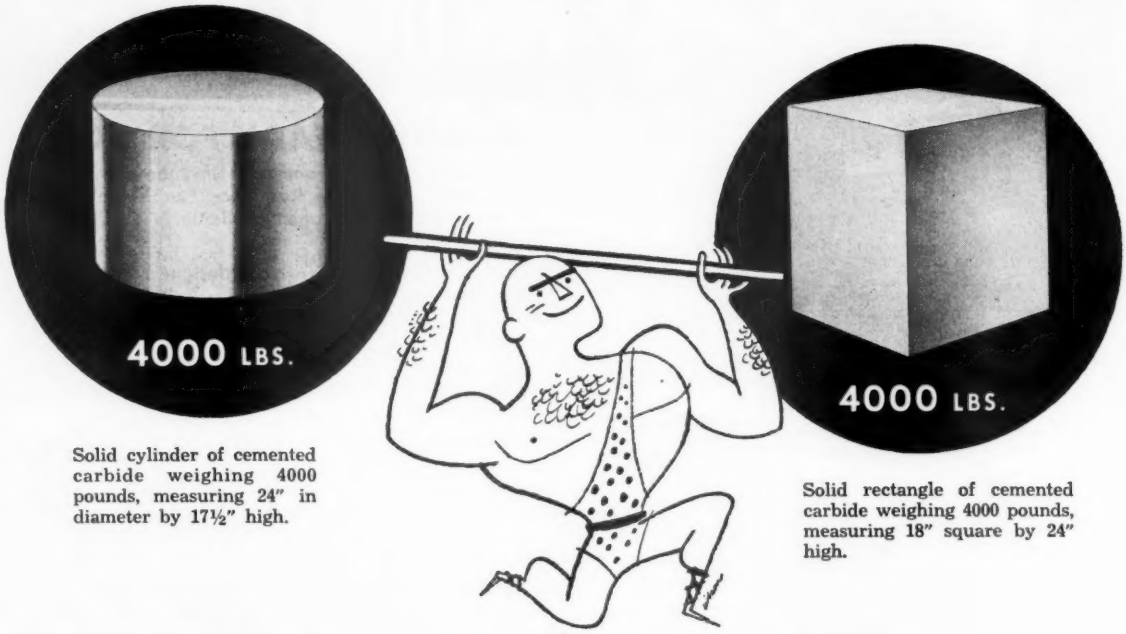
MILLS, DRILLS, BORES, REAMS & SHAPES ... *AT ALL ANGLES ... WITH ONE WORK SETUP!*

CLAUSING DIVISION, Atlas Press Company
5-115 N. PITCHER ST., KALAMAZOO, MICHIGAN

Atlas CLAUSING PRECISION MACHINE TOOLS — DIVISION ATLAS PRESS COMPANY KALAMAZOO, MICHIGAN U.S.A.

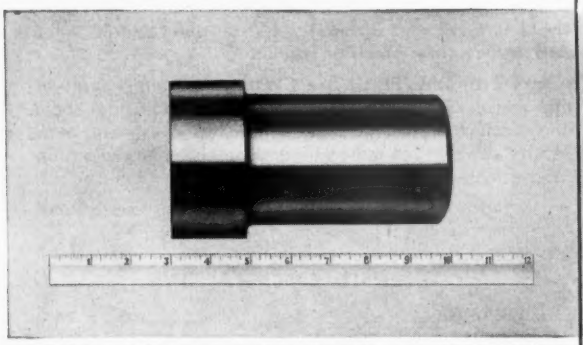
CIRCLE INFORM-A-GRAM KEY NO. 23

Now... 2-TON pieces

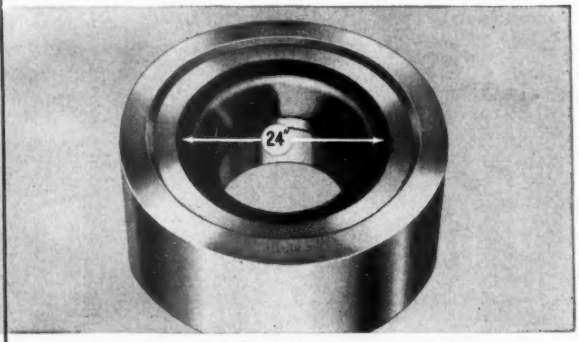


Solid cylinder of cemented carbide weighing 4000 pounds, measuring 24" in diameter by 17½" high.

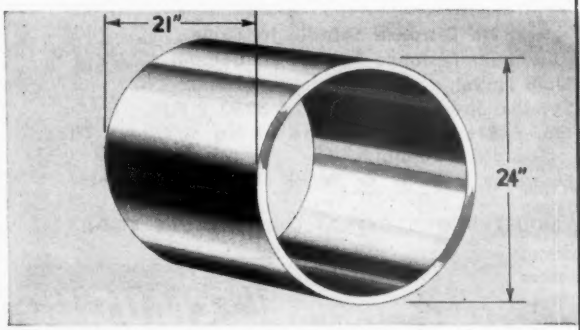
Solid rectangle of cemented carbide weighing 4000 pounds, measuring 18" square by 24" high.



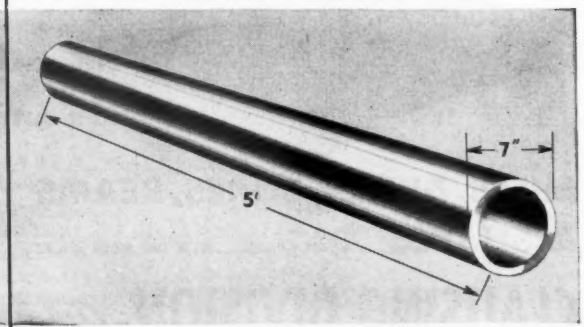
Solid carbide punch used in the cold extrusion of steel.



Ring dies up to 24" I. D. produced one-piece.



Carbide cylinders produced one-piece up to this size.



Carbide cylinders produced one-piece up to this size.

# of Carboloy® cemented carbide

New 220-ton hot press now in operation. Makes carbide pieces in either solid or hollow shapes—in heights up to 5 feet with maximum diameter of 7 inches. Or, in diameters up to 24 inches with maximum height of 21 inches. Up to 4000 pounds in weight. Processing time cut 50% by this method.

Among the many types and shapes the new press can produce are parts for large die sections, rolls for rolling steel strip, punches for cold extrusion work, large linings for brick molds and other parts where the costly factor of wear must be reduced.

Engineers surveying the field. This pressing technique for cemented carbides is so new, applications for it are constantly being developed. Carboloy engineers are helping manufacturers and die makers determine where and how large cemented carbide parts can reduce costs and increase production.

Survey your own plant. Why not survey your own plant for large part applications where wear is a problem. Carboloy engineers can give you specialized assistance. For additional information, please send coupon or write.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11111 E. 8 Mile Blvd., Detroit 32, Michigan

SURVEY COUPON

Gentlemen:
I would like to determine if large pieces of cemented carbide would reduce costs in the following applications:

_____

_____

Please have a Carboloy engineer ☐ call at plant. ☐ call for appointment.

Name _____ Title _____

Company _____

Address _____ Zone _____

City _____ State _____

CIRCLE INFORM-A-GRAM KEY NO. 24

Beaver STANDARD ARBORS AND ADAPTORS CUT DOWN-TIME LOSS—ASSURE ACCURACY FOR YOUR CUTTING TOOLS!

The finest economy in the purchase of arbors and adaptors is quality.

Beaver Standard Tools are made to unusually high standards of quality. No stinting is permitted on workmanship or materials. Beaver Standard Tools are made with the same care and accuracy as precision aircraft parts . . . hard, and wear resistant, on the surface but with a strong, tough core.

Remember, an extra set of arbors and adaptors is cheap insurance against loss from down-time in case of emergency.

You'll do a better job with less investment with Beaver Standard Tooling—try it, you'll like it too.

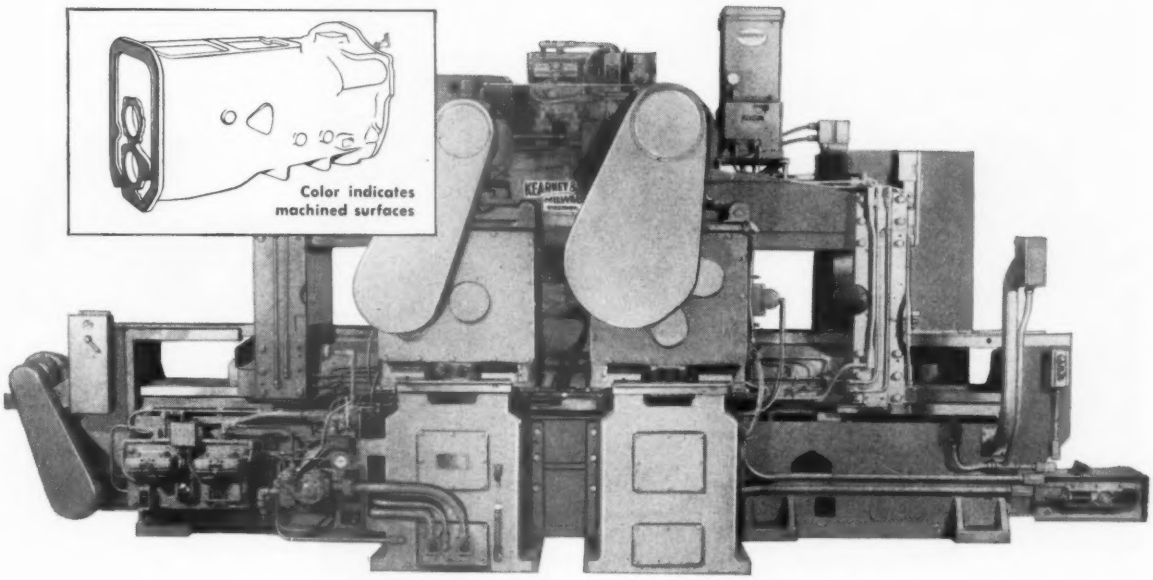
Beaver TOOL AND ENGINEERING CORPORATION

2850 ROCHESTER ROAD • BOX 429, ROYAL OAK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 26

What a saving...

Builders of Precision and Production Machine Tools since 1898



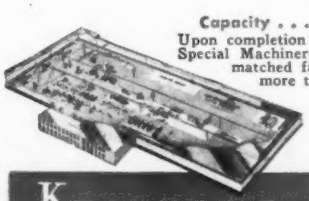
For the customer... it combined four milling operations in one machine!

THIS special 6-spindle transfer type milling machine was designed and built to keep a tractor manufacturer's production line rolling at high speed. The machine now mills opposing end faces of tractor transmission cases both flat and parallel . . . to close tolerances (.002) . . . in only 94 seconds.

FOUR HYDRAULICALLY RETRACTING HEADS... First two heads have two spindles each for roughing. Second two heads have one spindle each for finishing.

CLAMPING MECHANISM... Large hollow workpiece is secured at each machining station by a tunnel-type hydraulic equalizing clamping fixture. This eliminates the distortion usually encountered when clamping this type of workpiece.

If you have problems that require special machinery—contact your Kearney & Trecker representative.



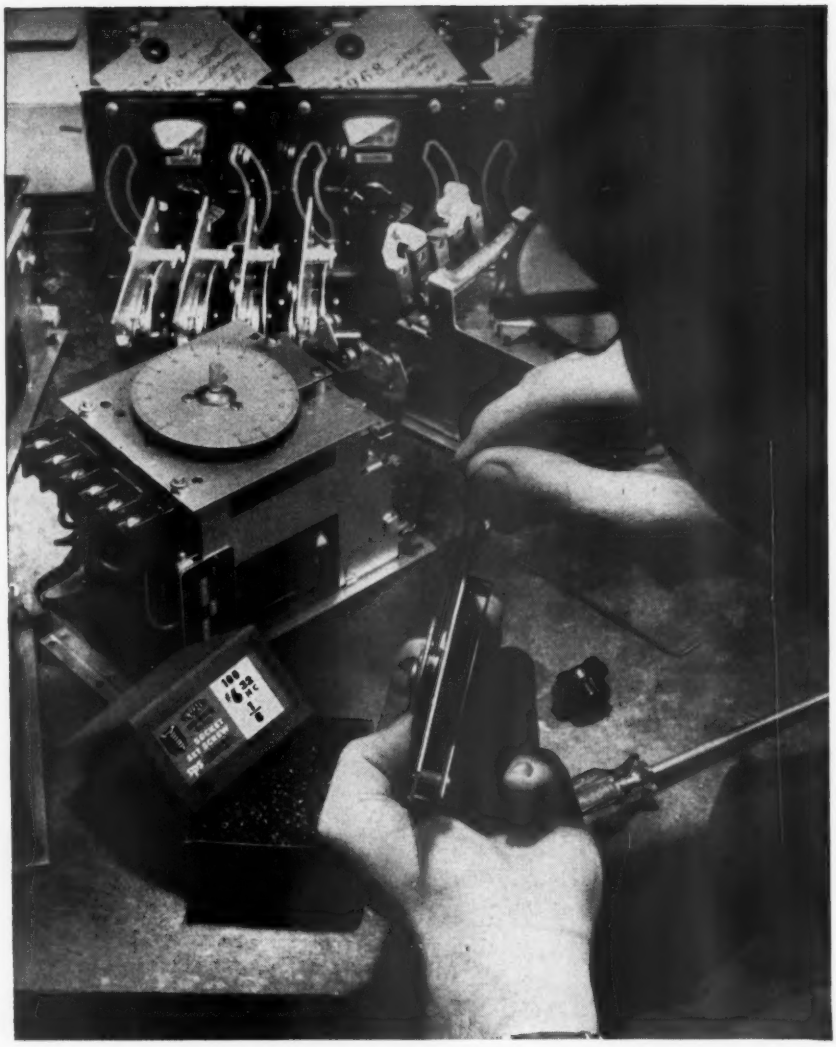
Capacity . . . Experience . . . Performance

Upon completion of this $5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.

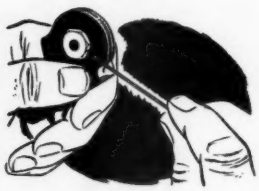
For more details on this machine . . . ask for *Data Sheet No. 1002.* Free booklet, "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking. *Write today to* SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 West National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER CORP. · *Special Machinery Division*
MILWAUKEE 14, WIS., U. S. A.

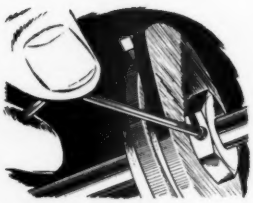
CIRCLE INFORM-A-GRAM KEY NO. 27



UNBRAKO **Self-Locking Socket Set Screws** are used to hold the Vernier-Set or Cycle-Progress cam on the shaft of this precision timing device. Once they are tightened, they maintain the accurate setting so important to the operation of the instrument.



Because they are so tiny, the UNBRAKO set screws are picked up and started in the tapped hole with the long arm key.



The compactness of the design of the timing device makes it necessary to turn the screw in prior to assembly. The uniform depth and size of the hex socket permit maximum torquing, speed assembly.

UNBRAKOS—made of heat treated alloy steel—have fully formed threads, Class 3 fit; have knurled cup point for positive locking. Are available in standard sizes from # 4 to 1".

You can lower your inventory by using UNBRAKO Standards—stocked by your distributor

You'll have less money tied up in inventory, you'll get personalized service, faster deliveries. In addition, you'll reduce assembly time and increase production with these precision industrial threaded fasteners. Write for UNBRAKO Standards—a complete listing of socket screw products made by SPS and stocked by your local distributor. STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA

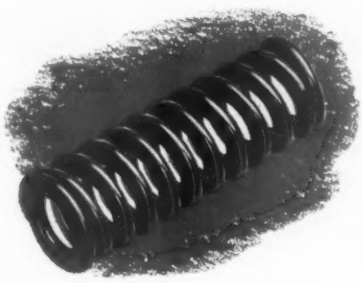
CIRCLE INFORM-A-GRAM KEY NO. 28

We asked hundreds of tool and die makers...

"What's wrong with the die springs you now use?"

Their answers sparked DIECO's metallurgical and design research...led to a complete new line that

out-performs others up to 3 to 1

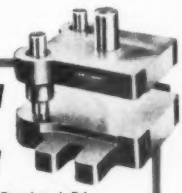


Working with leading spring specialists, Dieco engineers developed a complete new line of die springs which have licked the toughest spring problems.

Special steels were developed... special methods for treating them ...even special packaging methods to eliminate "growth" in transit.

Out of this field research and development came a line of more than 500 standard-size springs, in three distinct pressure classifications: Medium, Medium-High and High. For the first time, it became possible to "fit" the spring to the job at hand, to pick the precise pressure required for a given die action.

Now, satisfied users report that Dieco springs virtually eliminate downtime and wasted man hours due to die spring failure. If you have a tricky spring problem tying up your pressroom, call your local Dieco representative. He will be glad to help you pick the proper spring for the job. And to put an end to spring problems before they start... specify DIECO die sets and die springs.



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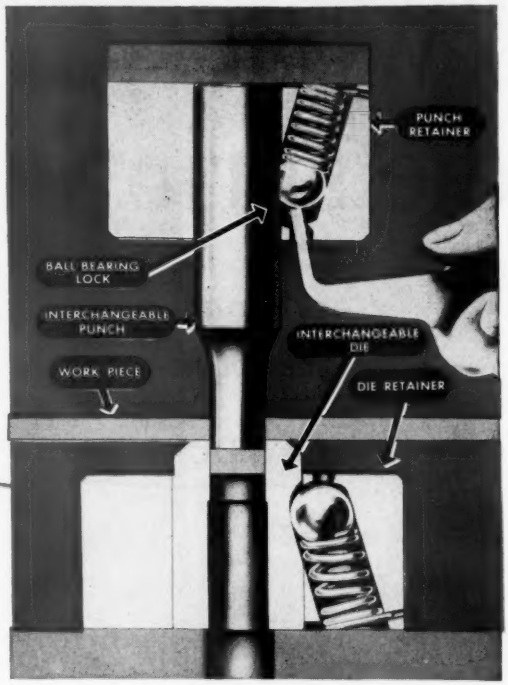

R-B standardized punches and die buttons are inserted in their retainers with a simple push and a twist.

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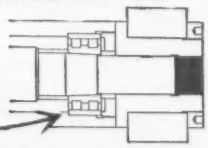
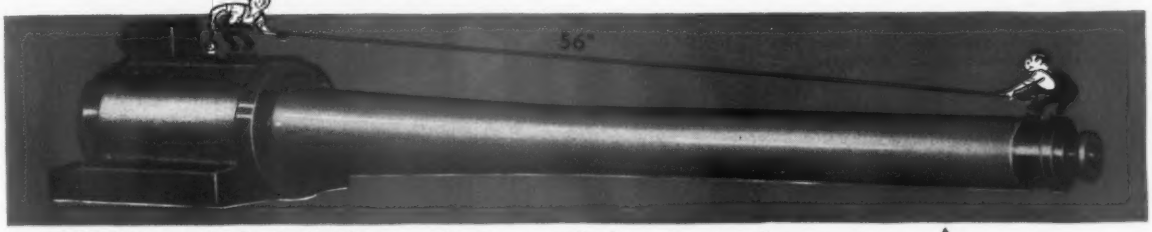
YOU CAN *Specify* POPE PRECISION SPINDLES WITH CONFIDENCE

TAKE THESE DEEP HOLE SPINDLES, FOR EXAMPLE

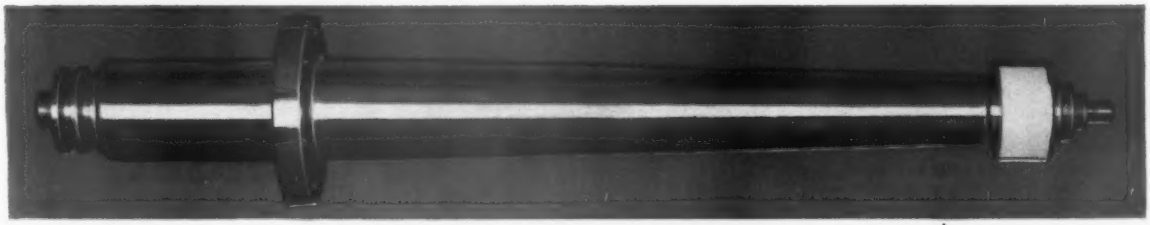


Only POPE Deep Hole Spindles are equipped with tapered bore, double row, cylindrical roller bearings close to the wheel for maximum rigidity.



POPE Deep Hole Spindles produce more holes per day because they can take heavy cuts; superior finished holes due to their shaft and bearing construction and Pope precision craftsmanship. Pope Spindles are dynamically balanced with all rotating parts in full assembly to insure smooth running and good grinding results.

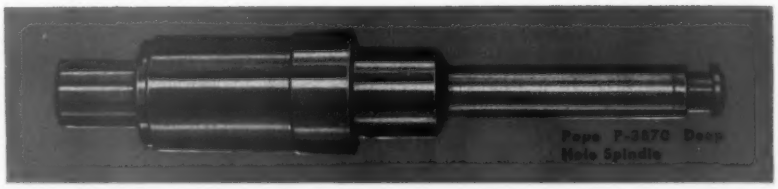
▲ **Pope P-5886 Motorized Deep Hole Spindle — 75" overall length, 4" barrel diameter at the wheel end, 6" at the motor end**



LUBRICATION — Pope System. The bearings are permanently lubricated for their entire operating life and require no further attention.

▲ **Pope P-16022 Belt Driven Deep Hole Spindle**

— an actual comment made by the operator of a Pope Deep Hole Spindle to a shop inspector.



Ask for detailed specifications and prices on Pope Heavy Duty Deep Hole Precision Spindles.

No. 98

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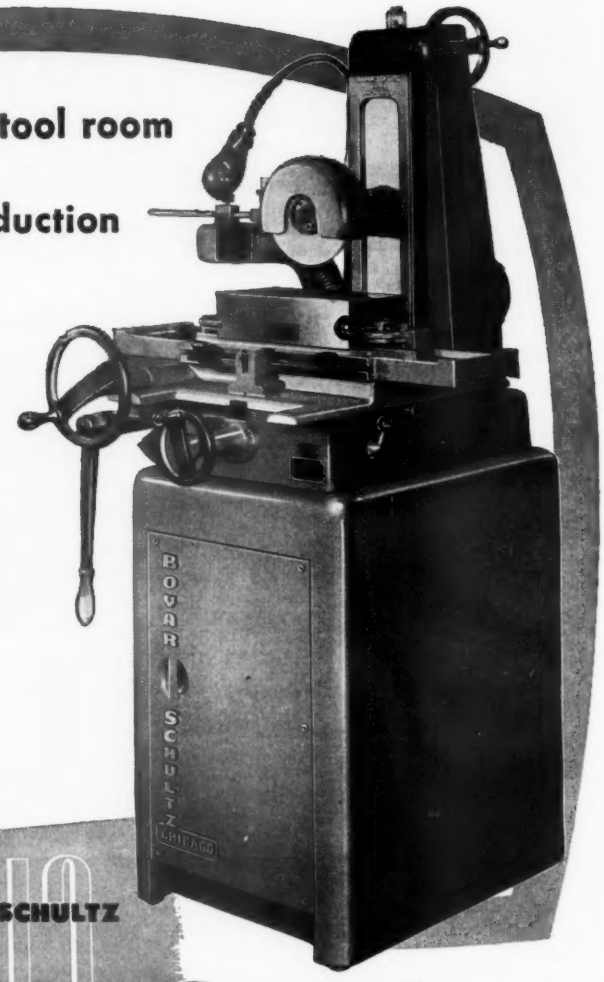
Precision for production



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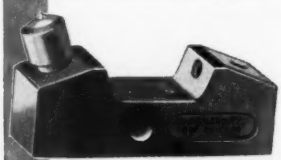

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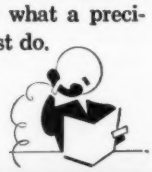

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Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

COMPETITION AND PROSPERITY

by Herbert L. Tigges
President

NATIONAL MACHINE TOOL BUILDERS ASS'N

FOR A GOOD MANY YEARS I have given considerable thought to just what it is about the United States of America that has put our country so far out front by comparison with the rest of the nations of the world.

What have we got that other countries haven't got?

I have come to the conclusion that the main answer is competition.

Our industrial and social structure in the United States has been founded primarily upon the competitive system. By contrast, the economic and social structures of the majority of the other countries of the world have been founded largely upon a system of cartels, allocation of markets, price fixing, government protection of marginal producers, and government interference with the operation of the law of supply and demand.

It is my firm conviction that our freedom to compete, the protection of that freedom, and our amazing capacity to preserve both cooperation and competition within each individual industry, are the factors which account both for American industrial supremacy and for America's top position with respect to living standards of the average citizen.

Now, a great many economists and forecasters have done a lot of talking about what kind of a year 1954 is going to be. These business prophets have built up

. . . *Continued on page 70*

This article is adapted from the luncheon address delivered by Mr. Tigges before the Annual Westinghouse Machine Tool Electrification Forum. Mr. Tigges is Executive Vice President of Baker Brothers, Inc. of Toledo, Ohio.

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why WALES HOLE PUNCHING & NOTCHING EQUIPMENT Can't be beat!

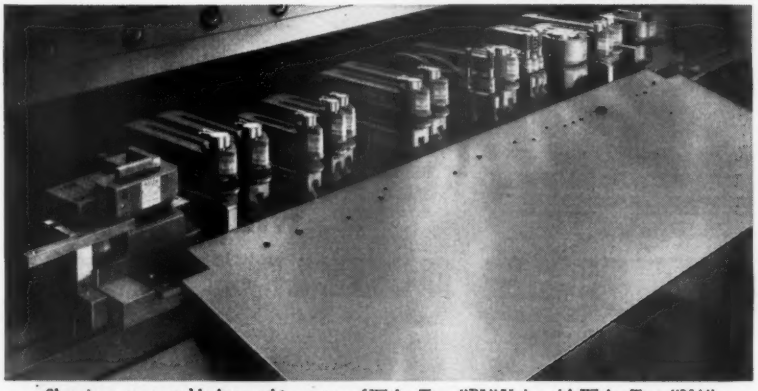
Independent, self-contained Wales Hole Punching and Notching Units *reduce setup time from hours to minutes.*

Check these Wales time saving, money saving advantages:

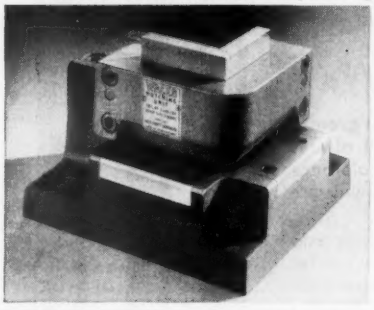
- Nothing attached to press ram
- Interchangeable punches and dies
- Punches and dies always in perfect alignment
- No die set required
- Press "down time" practically eliminated
- Used and reused in unlimited setups
- Makes setup a simple, quick assembly operation

Wales Hole Punching and Notching Units "can't be beat."

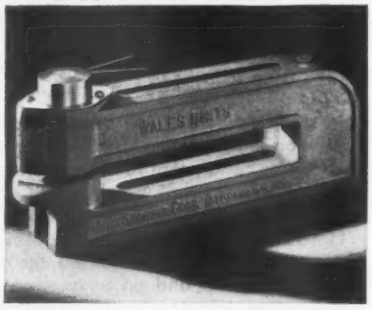
IT'S TOO BIG A STORY TO TELL ON THIS PAGE SO . . .



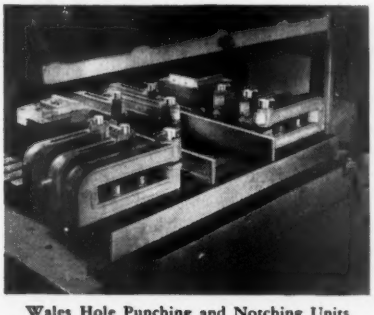
Showing a staggered hole punching setup of Wales Type "BL" Units with Wales Type "NA" Notching Units at each end for hole punching and notching in the same operation on a press brake. These same Wales Units may be set up in a stamping press as shown at bottom.



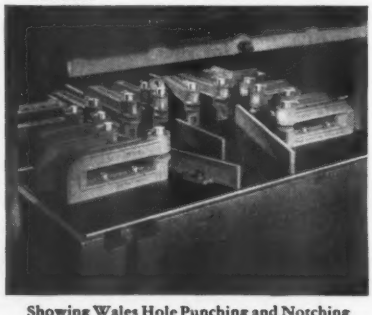
Wales Type "NA" Notching Unit for notching 90° corners.



Wales Type "BL" Hole Punching Units for punching round and shaped holes up to 2" in diameter.



Wales Hole Punching and Notching Units set up on "T" Slotted Plate in a stamping press.



Showing Wales Hole Punching and Notching Units set up on a template in a stamping press.

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quotes from the forum

The 18th Annual Machine Tool Electrification Forum sponsored by Westinghouse was, again, an outstanding success. To give you an idea of the value and variety of the subjects explored throughout the 2-day session we have garnered the following "quotes" from the many authoritative speakers and panelists.

"The art of electromachining appears capable of producing the highest conversion efficiency of any of the machining methods which have been examined or exploited and, as such, merits the intensive research program now in process." **C. Paul Porterfield, Method X Company.**

"To date, the electrolytic grinding method has found application almost exclusively in the sharpening of single point tools — a job normally done with diamond grinding wheels." **George Comstock, Norton Company.**

"With increasing popularity of fully automatic operations has come a barrage of demands of the machine tool builder that he build equipment to automatically duplicate the movements formerly made manually or semi-automatically. One of the most stubborn problems arising from these demands concerns positioning. Positioning is a waste of movement. It must then be done quickly and, as important, accurately."
Walton Rainey, Wiedemann Machine Company.

"In our opinion, the machine tool builder's responsibility is to provide the basic mechanism for loading, positioning, and unloading the parts; automatic gaging, where required, and a method of control which will automatically signal and shut down the operation when out of tolerance." **G. P. Krieg, Packard Motor Car Co.**

"Automation has made wonderful inroads, but there are also blind alleys in this, as in other new production concepts. Industry should look carefully before they are caught up by this industrial magic. They should keep in mind at all times the goals of automation and, above all, season their decisions with good common sense."
W. B. Shimer, DeSoto Division, Chrysler Corp.

"Since control devices are so important to the function of automatic and transfer type equipment, users are constantly searching for controls of the highest quality. Large equipment, involving high capital investments, must be assured against failures traceable to seemingly trivial causes." **R. W. Kowitz, Ford Motor Company.**

"We are a long way off from having licked the problems of today and before we apply much more automation, we should take steps to make better what we already have in operation."
Harold Hardenbrook, Buick Motor Company, General Motors Corporation.

"The trend now is to consider automation as part of the machine tool. Many tool users are asking for this and the tool builders are looking favorably on this business. They see it is working all right."
E. E. Opel, National Automatic Tool Company.

"If the production plant of tomorrow is to be a completely automatic plant, the development of the machinery that goes into that plant will of necessity be designed with maintenance as a predominant factor in that design." **R. N. Johnson, W. F. & John Barnes Company.**

"Just as workpiece design has to be adapted to automation of the machining process, so too must tool design, and along with it, tool wear, tool changing, and regrinding be given primary consideration rather than be treated as an afterthought." **A. O. Schmidt, Kearney & Trecker Corp.**

"But automation will eventually reach the job shop level, and users and builders alike will have to supply some not-too-easy answers." **T. W. Bannon, Clearing Machine Corporation.**

"Now users and builders are talking about automatic factories, job shop automation, and similar new horizons. If automation is to be extended to such limits, the first long step will be to economically automate the countless smaller machines, which may have to handle various rates." **E. L. Behringer, Micromatic Hone Corp.**

"The fact that this equipment can be made to measure deviation, and also indicate excess of tolerance by relay contacts, allows it to be used for automatic re-adjustment of tooling."
Harlan E. Grimes, The Avey Drilling Machine Company.

"Although these particular automatic lathes have been applied specificially to the machining of camshaft bearing surfaces, a similar automated set up could be employed for the other types of parts. All automatic lathes are flexible in design insofar as size, tool arrangement, work transfer capacities, and gauging are concerned."
R. J. Peck, Seneca Falls Machine Company.

E. Willard Pennington.

Editor

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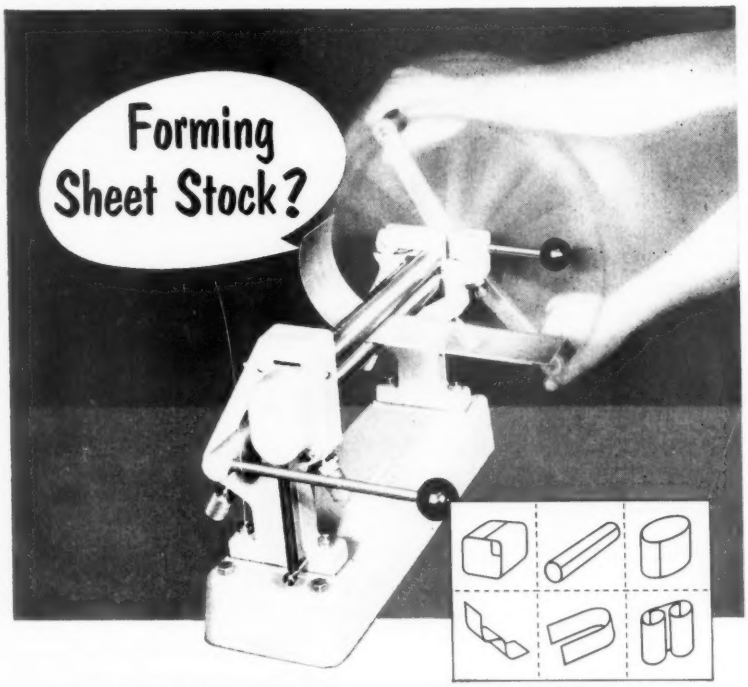
QUICK PIC CATALOGS 75
Look - - a pictorial selection of today's newest literature. Reach up on the rack - - - take your pic.

PUBLICATION PREVIEWS 90
Capsule description of current literature. Bulletins, brochures, catalogs and circulars - - - You name it.



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O'NEIL-IRWIN MFG. CO., 315 8th Ave., LAKE CITY, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 38

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Competition is the reason for the existence of the machine tool industry. To meet competition in metalworking, the machine tool must lower the cost per piece produced.

QUALITY CONTROL. "How to Determine Quality Capability of Machines and Tools" by Harmon S. Bayer & Associates 41
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Magazine loading of bar stock to automatic screw machines has increased production by at least 50% over the frequent loading by hand method.

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A report on the determination of the fatigue-life relationship between nitriding and shot-peening performed on an automotive-type crankshaft.

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Need help in any aspect of modern metalworking? See this section for materials and design aids, inspection and production techniques.

PROGRESS ON PARADE **110**
Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.

For greater
ACCURACY, RANGE, SPEED
in grinding perforators!

A few examples of perforator shapes that can be made faster and easier with Grind-All.

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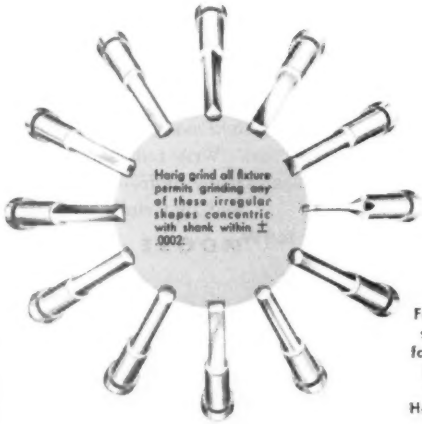
Grind All
Fixture

Easier movement now possible with new pre-loaded ball bearing type of construction.

Patent No. 2449459

With the Harig Grind-All fixture, you make perforator grinding setups THREE TIMES FASTER — grind a variety of regular and irregular contours with the greatest possible accuracy and widest operating range. Exclusive radius generating feature makes fixture particularly adaptable to carbide grinding.



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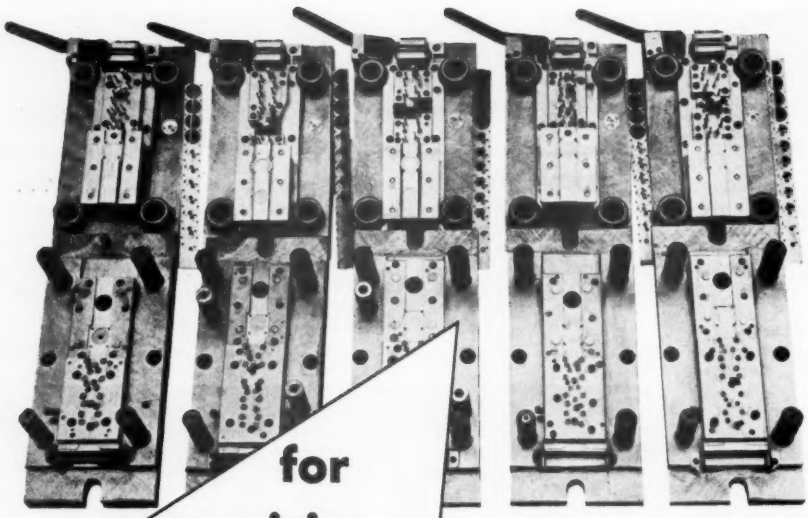
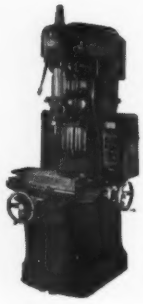
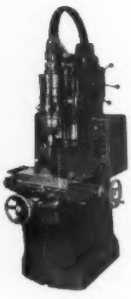


for precision jobs like this....Moore Jig Borers and Jig Grinders are "MADE TO ORDER"



NO. 2 MOORE JIG BORER. Range 10" x 16" x 16" height. Features infinitely variable spindle speeds, three power feed ratios, centralized controls.



NO. 2 MOORE JIG GRINDER. Range 10" x 16" x 16" height. Grinding speeds from 12,000 to 60,000 rpm. Infinite feeds up or down; spindle-housing heat control; features slot grinding attachment.

Moore Jig Borers and Jig Grinders are made to order for jobs that require precision hole location—and plenty of it.

Take, for example, these five progressive compound dies used to pierce, shave, gut and blank intricate timing-device parts.

Holes in punch plate and stripper were jig bored in a No. 2 Moore Jig Borer. Holes in the corresponding die parts were jig bored in the same precision machine, hardened and then jig ground in a No. 2 Moore Jig Grinder. Perfect line-up was insured, since all holes had to be held to ± .0002", both for position and hole size.

The No. 2 Moore Jig Borer, with its built-in system of accurate lead screws, can spot, drill, bore or ream all holes in a workpiece to "tenths" with minimum tool changes. The No. 2 Moore Jig Grinder can accurately contour grind, slot grind and form grind die sections in a third of the time required by other means.

These Moore toolroom teammates provide a one-two punch that can knock the fat off your diemaking costs. They supply an *Engineered Hole Location Service* that permits tool and die sections to be produced concurrently...puts diemaking on an interchangeable-parts-and-assembly basis...lengthens die life...*saves you time and money* all along the line.

Write today for our detailed literature that pictures and describes many toolroom and production jobs for which Moore Jig Borers and Jig Grinders are made to order.

MOORE SPECIAL TOOL COMPANY, INC.
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ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS · JIG GRINDERS · PANTO-CRUSH WHEEL DRESSERS · DIE FLIPPERS · MOTORIZED CENTERS · HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 40

how to determine QUALITY CAPABILITY OF MACHINES AND TOOLS

AS THE BENEFITS of Statistical Quality Control continue to expand in American industry, certain aspects assume even greater value as experience proves their worth. One of these aspects is the expansion and development of a technique called Quality Capability Analysis. This technique has been used to great advantage to measure the quality efficiencies with which tools and machines can perform.

The Need

It is not an exaggeration to state that almost invariably, a firm will know in every detail the production rates of their machines or tools. However, it is regrettable that almost invariably a firm will not know what total spread a certain machine is capable of maintaining on an operation. It is true that there may be an opinion or even a guess concerning this vital factor in production but facts are usually not obtainable.

It is also regrettable that in many cases tool and machinery manufacturers are entirely ignorant of the quality capabilities of their machines. This leads to situations which are not uncommon in the relationship between the seller and buyer of tools and equipment. The tool or machinery producer, in some cases, will claim that his product will produce to certain dimensional limits which are entirely unrealistic and in no way can be attained by the equipment. In other cases, when a manufacturer wants to buy the piece of equipment and requests assurance that this equipment will produce to desired specifications, the tooling manufacturer is loath to assure this control. There are many cases where the tool can do the job and the producer by not knowing and claiming his just deserts may risk losing a sale.

In the case of the manufacturer who claims a closer control than the machine is capable of, the writer does not believe that sharp sales practices are intended. Unfortunately many manufacturers of tooling do believe that their tools are capable of much greater accuracy than experience bears out. In the case of the manufacturer who doesn't claim the accuracy his tool is capable of maintaining, certainly he isn't realizing the full fruits of his own labors.

by Harmon S. Bayer

HARMON S. BAYER & ASSOCIATES
Quality Control Consultants
Detroit, Michigan

The Answer

Quality Capability Analysis is a tool which can be used to provide factual evidence concerning what dimensional variations the machine **is capable** of maintaining. Note that the statement was not what dimensional variation the machine **is** maintaining. This illustrates the extent of the usefulness of this technique.

It not only provides information as to what variation is being produced at the time of the study, but the analysis also reveals what improvements in variation can be expected if quality controls are established on the machine and adjustments are made to take full advantage of the capabilities of dimensional control that the machine in its **present** state of maintenance can perform.

What is Quality Capability Analysis?

Quality Capability Analysis is a phase of the science of Statistical Quality Control. Employing the principles of probability and statistics, it is used to analyze the practical limits of dimensional variation which a machine, tool or process is capable of maintaining.

As an illustration of its practical value to machine producers and users, the following case histories are offered:

The Situation

The writer was called upon to solve a problem which had been plaguing a manufacturer of screw machine parts. There was a battery of 6-spindle Gridley Automatics being used for this operation. Trouble was being encountered on a forming operation of an arc contour. The blueprint called for the measurement of two datum dimensions to control the contour as produced by the form tool. For purposes of illustration we will call these Datum Dimension A and Datum Dimension B, Figure 1.

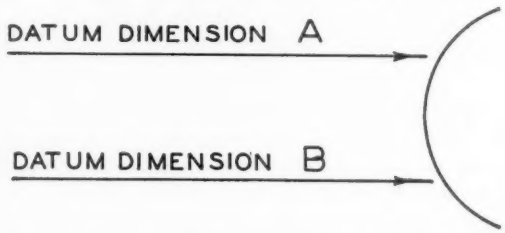

Fig. 1. Measurements of two datum tolerances on an automatic screw machine-formed contour were used to determine the capability of the setup in the author's Case History No. 1.

The blueprint called for a dimensional tolerance of .005" for each datum dimension. The past history on this operation had shown approximately 5% scrap and rework for failure to meet these datum dimension tolerances. Another complicating factor was that the jobsetters were forced to regularly shut down machines to make adjustments, resulting in high maintenance costs. Difficulties in meeting production schedules were also prevalent. In order to meet the customer's requirements for dimensional control, a team of 18 inspectors was assigned a full time job of measuring all production 100% on the finish part and sort the defective parts.

Performing the Quality Capability Analysis

In order to determine the condition, the writer conducted a Quality Capability Analysis of the operation.

Taking and Recording the Data

Datum Dimensions A and B were checked and recorded for 100 consecutively produced pieces for each of the six spindles. All data were kept separate according to the spindle that produced the part. Figure 2 shows a portion of the form used to record the data. Inasmuch as it would be impossible to maintain the order of pieces from each spindle and measure them as fast as they were being produced, separate trays were used in which the parts being produced on each spindle were placed in the order they were made. The measuring operation was then done and recorded on the form, Figure 2.

For purposes of demonstration let us refer to Figure 2 to follow the calculations involved in this Quality Capability Analysis.

The first column indicates that Spindle No. 1 produced five consecutive pieces with Datum

Fig. 2. A portion of the form used to record Datum Dimensions A and B of 100 consecutively produced pieces by each of the six spindles.

SPINDLE	1		2		3		4		5		6	
DATUM	A	B	A	B	A	B	A	B	A	B	A	B
SAMPLE 1	3.8	1.6	3.0	1.6	4.5	3.2	3.8	2.5	4.2	1.3	4.0	2.2
2	4.8	2.8	3.5	2.3	4.2	2.5	4.0	2.5	3.7	2.2	4.6	2.4
3	5.2	3.6	3.2	1.5	3.8	2.2	3.9	2.8	4.5	2.4	4.0	2.0
4	4.8	2.9	2.3	1.2	4.5	3.2	4.9	3.6	3.0	1.0	1.6	.8
5	3.8	2.0	3.5	1.8	4.2	2.7	3.5	2.0	4.2	2.5	2.8	1.4
TOTAL	22.4	12.9	15.5	8.4	21.2	13.8	24.1	13.4	19.6	9.4	21.1	8.8
AV. $\overline{X}$	4.48	2.58	3.10	1.68	4.24	2.76	4.82	2.68	3.92	1.88	4.22	1.76
RANGE	1.4	2.0	1.2	1.1	.7	1.0	1.4	1.6	1.5	1.5	3.0	1.6

TABLE I

Spindle No.	Approximate Average Dimension	Approximate Total Variation	Low Reading	High Reading
#1	3.0	4.2	1.0	5.2
#2	3.0	3.5	1.3	4.8
#3	2.5	4.0	1.2	5.2
#4	2.0	4.8	0	4.8
#5	3.3	4.5	1.0	5.5
#6	3.3	3.8	1.2	5.0
All spindles combined	3.0	5.5	0	5.5

Dimension A as follows (stated as thousandths):

3.8 4.8 5.2 4.8 3.8

Datum Dimension B measured:

1.6 2.8 3.6 2.9 2.0

Only Datum Dimension A will be considered below.

Constructing the Histogram

In order to further analyze the distribution of values as each measurement was recorded,

MEASUREMENT GROUPING INTERVAL	DATUM DIMENSION A FREQUENCY
5.4 to 5.6	
5.1 to 5.3	/
4.8 to 5.0	/ /
4.5 to 4.7	
4.2 to 4.4	
3.9 to 4.1	
3.6 to 3.8	/ /
3.3 to 3.5	
3.0 to 3.2	
2.7 to 2.9	
etc.	

Fig. 2-A. The frequency distribution of the five Datum Dimension A values from Figure 2.

the five Datum Dimension A values shown above were tallied as in Figure 2-A.

The tally of the rest of Datum Dimension A Spindle No. 1 values indicated a distribution of values as shown in Figure 3. This in turn was plotted graphically and is called a histogram, Figure 4.

Analyzing the Situation on the Basis of the Histograms

Let us analyze this histogram on the Datum Dimension A. This indicated that the variation for the 100 pieces was in fact limited from 1.2 to 5.2 or a total of approximately 4 thousandths. Now the total variation allowed was 5 thousandths. One might ask, "Why wasn't this spindle producing within specifications?"

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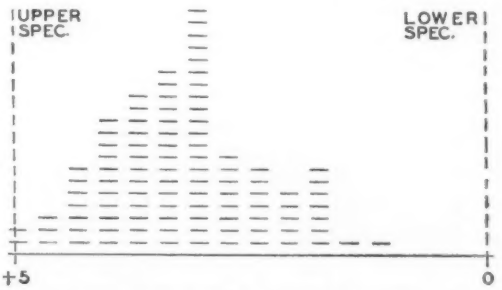


Fig. 3. The tally of all of the values found for Datum Dimension A, Spindle No. 1.

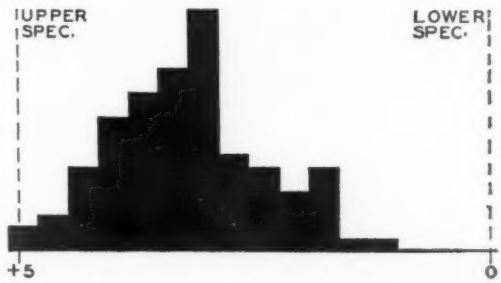


Fig. 4. This histogram was constructed by plotting, graphically, the tally pattern of Figure 3.

Plastic Tools Reduce Costs at Boeing

by Ray Bloomberg
Seattle, Wash.

A Boeing punch press operator holds in his right hand the plastic "wiper block" which, with the die in his left hand, forms the part held in the fingers of the left hand.

AN INTENSIVE USE of plastics in production tooling has enabled the Boeing Airplane Company to reduce tooling and labor costs, save strategic metals and obtain better tools.

As a result, the company's plastic tooling shop has grown in one year from a one-man operation using five gallons of resin each month to an 18-man shop using 800 gallons. Further growth is anticipated by B. K. Bucey, Boeing tool design manager, who predicts that "five years from now you'll see a high percentage of aircraft production tools being made in plastics."

One of the plastic tools proving better and more economical than its metal predecessor is a metal-bonding jig, a large tool which makes possible the fixing of stress members to aircraft skins with an adhesive. Previously, rivets and spot-welds did the job, with unavoidable distortion of aerodynamic surfaces.

In early form, the metal-bonding jig was formed of aluminum and wood. Cumbersome and difficult to handle, it also was expensive. If dropped or bumped, it had to be reworked at a cost of more than $500 to bring it to within the 0.002 of an inch horizontal tolerance allowed.

The plastic jig is easier to make and to use and costs about $3,000 less. It is shaped over a wood-and-plaster form using Polyester resin and Fiberglas cloth, then is "cured" in a vacuum bag which holds the plastic to the form.

Boeing figures that plastics have been put to best use in the manufacture of mandrels, plaster forms around which plastic production

Plastic metal-bonding jigs are placed over stress members to hold them to aircraft skin for bonding at 350°F in the Boeing Airplane Company's Seattle plant.

parts for airplanes are made. In the past, heavy molds were used to form half a mandrel at a time. Besides being inefficient, these molds were a headache after each half-mandrel was cast, the excess plaster had to be scraped from the mold. After 40 half-mandrels were made, the mold had to be reworked to bring it back to its original shape before being distorted by scraping.

With Pacific Plastics, a Boeing subcontractor, Boeing tooling engineers developed a plastic "slosh mold" to take the place of the old-style ones. The slosh molds, now in use, are formed in two or three sections, depending on the configuration desired in the mandrel and the plastic production part. The sections are fastened together. Plaster is poured in and sloshed around to reach all surfaces. When the plaster has set, the mold is taken apart and a complete mandrel emerges, ready for the plastic production shop.

As a result of this operation, expensive time is saved and the production rate tripled.

Plastics were used first in tooling in the manufacture of "drill cages", placed against sheets of metal to guide semi-skilled hands in making the perfect components necessary in aircraft production. Drill cages made of metal rippled and lengthened due to the insertion of press-fit bushings in the holes which guide the drills, resulting in wastage of material and man hours. With plastic drill cages, steel bushings can be inserted at exactly the right points before the plastic is cured and remain true in the finished product.

This plastic spot welding jig has proven a big help to new hands.

Plastics also are used in the manufacture of apply trim templates, used as guides in the accurate trimming of metal parts. Before plastics were used, ten hours of skilled sheet metal work was required to make the average apply trim template. A plastic template just as good now can be made in three hours, by comparatively unskilled workers, using as a pattern a sample of the part on which the template will be used.

Another use of plastics is the "wiper block", employed to form complex curves and joggles.

Boeing tooling engineers eye experimental use of a plastic shape-fixer which weighs only 40 lbs. This is compared to the metal tool it replaces which weighed 150 lbs.

Speaking of his story on preventive maintenance for turret lathes, Mr. DeSilvey volunteered that "One fairly sure way to prolong the life of your machines would be to sell them to the operators, . . . " Rather than trying to open up that market, you can derive benefit and profit by reading what he has to say on his favorite subject.

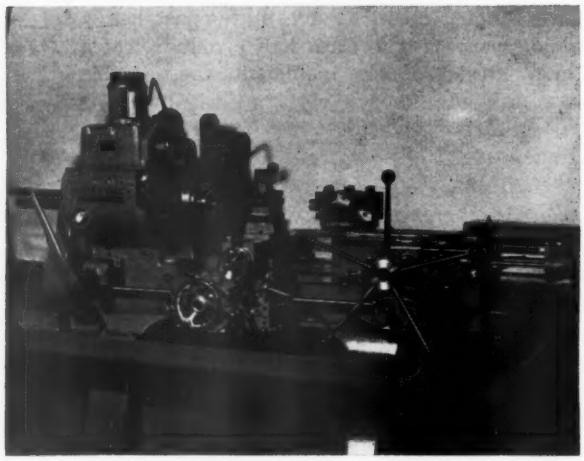


Photo courtesy of Eastman Kodak Co.

Fig. 1. Fully reconditioned Warner & Swasey turret lathe ready for productive operation at the Hawk-Eye Works of Eastman Kodak Company.

Your Turret Lathes Deserve the Best . . .

PREVENTIVE MAINTENANCE

by John B. DeSilvey
President
THE DeSILVEY CORPORATION
Williamsville, New York

AS SPECIALISTS in reconditioning Warner & Swasey equipment, Figure 1, we will make specific reference throughout this article to their mechanisms. The principles discussed, however, apply to all types of turret lathes.

The indiscriminate use of an air hose in cleaning a machine and the subsequent blowing of chips into the ways reduces the useful life of the machine. One way to lessen this dangerous condition is to run a rigid air line to a point approximately 18" above the spindle nose, Figure 2, and attach a short piece of air hose at this point so that the only part of the machine which can be reached is the chuck or holding fixture. With this arrangement, air, which is the only positive method of cleaning the jaws for positive location, is not likely to force foreign matter into the sliding members.

Fig. 2. A simple method of installing an air hose so as to minimize the danger of blowing foreign matter into the ways.

The unavoidable introduction of abrasive materials into the bearing surfaces makes it advisable to do the following to ram type machines at least every 90 days:

1. Remove hex turret slide, following instructions in your service manual, and thoroughly cleaning all foreign material from under hardened wear plates and around gibs.
2. Wash all felt and leather wipers thoroughly or better still, replace these wipers with new ones.

3. Remove hex turret, and clean the bearing surface and tapered roller bearings on which it rides.
4. Re-assemble and adjust gibs to marks which show original factory setting.
5. Check setting of saddle aligning screws. See Figure 3.
6. Remove and clean the cross slide and gib.

It may be necessary, under extreme adverse conditions, to do the above six operations oftener. Under no circumstances should the gibs be loosened to free the slides as this increases the opening, allowing greater accumulation of dirt and chips which increases the possibility of scoring the ways. These cleaning operations should not take longer than two hours and will pay for themselves many times over. After the hex turret slide is re-assembled, a check should be made of the turret hole alignment which can be done with the simple micrometer fixture shown in Figure 4. The procedure for taking these readings is shown very clearly in the Warner and Swasey service manual and can be used for any turret lathe.

The lubrication schedule recommended by the manufacturer should be followed to the letter. Much engineering has gone into the selection of the proper lubricants and any deviation from the schedule is an invitation to trouble, especially in hydraulic units.

The multiple disc clutches in the head-stock of turret lathes are built to take a lot of abuse. A few simple precautions will save a lot of trouble in the future. A definite pressure should be felt when engaging the head clutches, and it is important that both forward and reverse clutches be maintained in balance. That is to say, both clutches should require the same pressure for engaging. If the clutches are operated when loose, the discs will slip excessively before the spindle reaches maximum speed — producing premature wear on the plates. An out-of-balance condition between the forward and reverse clutches may cause drifting of the spindle in the neutral position which endangers the operator.

Frequently, on older machines that are not equipped with a hydraulic head brake, the reverse clutch is used as a brake. This is not a recommended practice since there is danger of reversing the entire gear train at high speeds with dire results. This situation becomes more dangerous as the centrifugal force increases on the holding equipment.

Much can be done to maintain easy shifting of the gears by using the proper method of

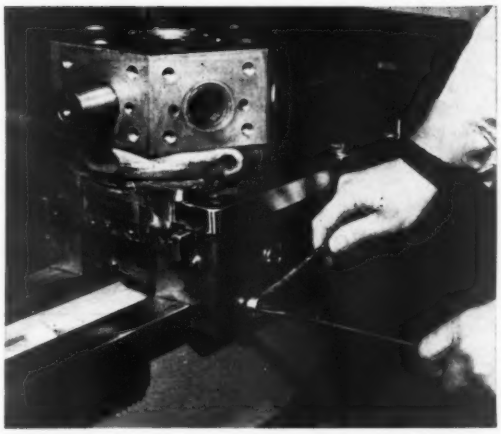


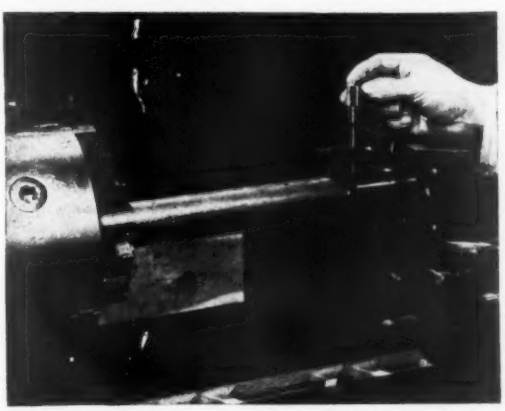
Fig. 3. Before checking alignment of hex turret slide with spindle, the saddle aligning screws should be adjusted as shown here.

making speed changes. From our experience, Warner and Swasey gears never die; they just keep rolling along. But, improper shifting can cause difficulty in making speed changes as burrs are raised on the teeth. When making speed changes on any machine, the best practice is to put the clutch lever into the brake position and, just before the spindle stops, make the shift rapidly to minimize the rubbing of gear teeth against each other producing burrs.

The heart of the machine is the spindle and care should be taken to maintain the adjustment of the spindle bearings. The original factory adjustment should last through the life of the machine, but an occasional check of this adjustment will help in maintaining accuracy and finish. This adjustment can be checked as follows: Chuck a piece of hex stock in the

. . . Continued on page 150

Fig. 4. A simple fixture for checking the alignment of the hex turret, using a 1½" diameter hollow tube and bracket for micrometer.



Keep Carbide Cutting Tools SHARP - -

PROVIDE CENTRALIZED FACILITIES
where carbide grinding specialists and the proper equipment can be made available. Machine operators should not be permitted to grind their own tools.

USE GRINDING MACHINES
designed for carbides — built rigidly for positive cutting of hard metal and for higher wheel speeds (4500 to 5500 fpm). Bearings and motor should be shielded against dust and coolant. Motors should be reversible.

FREEHAND GRIND

Sharpen:
SINGLE-POINT TOOLS
FLY OR STEP-CUTTER TEETH
DRILL TIPS
SCRAPER BLADES

On Freehand Carbide Grinder, using cup wheels. Keep tools moving. Use sliding sub-table

ROUGH GRIND
on 14" 60-grain silicon-carbide wheel*

Optional:
SEMI-FINISH
small finishing tools, or
FINISH GRIND
large roughing tools on 10" 80 or 100-grain silicon-carbide wheel*

FINISH GRIND
on 6" 120 to 320-grit diamond wheel†, according to work finish required

GRIND CHIPBREAKERS
(Steel-Cutting Tools)
on Chipbreaker, Surface, or Universal Grinder, using 100-grit straight diamond wheel†

MACHINE GRIND

Sharpen:
SOLID CARBIDE PRECISION BORING TOOLS

On a Duplicating Precision Grinder, using straight wheel

ROUGH GRIND
only where tool has been damaged. Use a 220-grit diamond wheel†

FINISH GRIND
on 400-grit diamond wheel.† Usually a solid carbide precision-bore tool, when it finally is worn to where chatter marks or lower micro-reading appear, is worn only sufficiently to require minor touch-up. This constitutes more of a lapping than a grinding operation.

Sharpen:
FLAT OR CIRCULAR FORM TOOLS
SOLID INSERT TOOL BITS
C'LESS GRINDER BLADES
SURFACE BROACHES

On Reciprocating Table-Type Surface Grinder
Use a straight, flaring cup, or dish wheel according to operation to be performed

ROUGH GRIND
on 100-grit diamond wheel†

FINISH GRIND
on 180 to 320-grit diamond wheel† according to work finish required

Sharpen:
MILLING CUTTERS
REAMERS
THREAD CHASERS
C'BORES • SPOT FACERS
HOBS • SAWS

On Universal Tool & Cutter Grinder
Use a straight, flaring cup, or dish wheel according to operation to be performed

Optional:
Where considerable stock must be removed by circle grinding, use 80 or 100-grit silicon carbide wheel*

ROUGH GRIND
on 120 to 180-grit diamond wheel†

FINISH GRIND
on 180 to 240-grit diamond wheel† according to work finish required

---

* "Green" silicon carbide wheel, vitrified-bond. Preferably use dry, but with efficient exhaust system for dust removal. When grinding wet, use continuous stream of coolant at point of cutting.

† Soft resinoid-bonded wheels of "100" diamond concentration. Always use vapor, mist, or continuous stream of coolant with diamond wheels. Direct coolant against wheel ahead of cutting, rather than on tool tip.

AVOID GRINDING of steel on silicon-carbide or diamond wheel. Use aluminum oxide for grinding steel tool shanks or cutter bodies. Conversely, do not attempt to grind carbide on aluminum oxide wheels, which are not hard enough to cut cemented carbide.

HARDEST GRADES of carbide—ordinarily used for precision finishing (such as Carboloy Grade 831)—should be rough ground gently so as to avoid heat rise or sudden temperature change. Finish grind with fixed feed not to exceed 0.0004" per pass. Preferably use only diamond wheels for both rough and finish grinding.

MICRO-FINISHING: Experience in many plants indicates that exceptionally fine finishes on carbide tools measurably improves tool life over ordinary grinding. Usually this means a greater number of perfect pieces per grind and often results in fewer inspection rejects. Super, mirror, or micro-finishes can be applied by lapping or polishing with diamond, boron-carbide, or silicon-carbide powder or paste on special lapping discs—usually cast iron or hardwood. Such finishes are seldom necessary and are often impractical for economy reasons. This can usually be determined only by trial, in the particular plant concerned.

TOOL GRINDING

Can be Stealing Your Dollars

by Watson N. Nordquist
Technical Editor

DIAMOND WHEELS cost many dollars. Cutting tool replacements can be costly. Machine downtime and lost production represent lost dollars. Inadequate or obsolete tool grinding methods may contribute unnecessarily to the excessive cost of all of these items.

If there is a dollar to be saved per tool or per job by the use of a new grinding technique, and if this unit saving can be multiplied many times, then Tool Grinding is costing you too much money. The savings possible are greater with carbides; so, we'll talk primarily about carbide tool grinding.

Carbide tool life can be increased, machine tool downtime can be lowered, and wheel costs can be reduced by following a systematic and progressive tool grinding program. By "progressive", we mean a program that is flexible enough to permit the thorough exploration of new developments in the art and science of tool grinding.

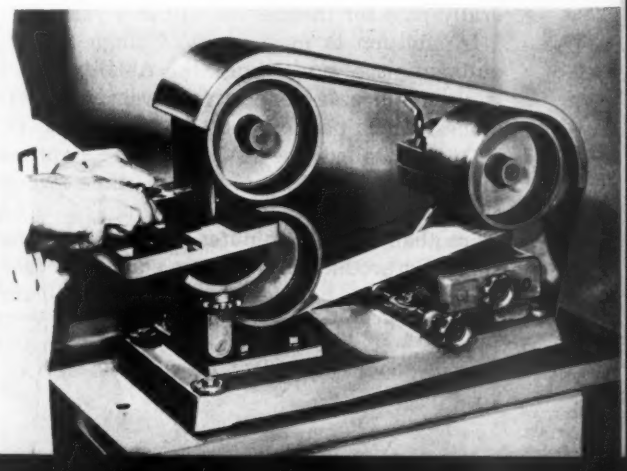
So many new carbide grinding processes, new machines, and new wheel types have come to the fore within the last two or three years — that a restatement of certain basic procedures seems to be very much in order.

Each of these recent developments has cost-saving possibilities, in varying degree to be sure. Some are capable of quite spectacular performance. But each is economically applied to only a certain class of work. And this may vary from plant to plant. Each must be properly "fit" into a sound, well-integrated framework of good grinding practice.

Such a framework can be built around the basic recommendations shown in chart form on the facing page. Centralized carbide grinding facilities and centralized responsibility for the tool grinding program are absolutely essential. Guiding principles for such a program have been outlined by the author in Section I of the "CCC Operating Manual", issued by Carboloy Department, General Electric Company, in conjunction with its Coordinated Carbide Control plan.

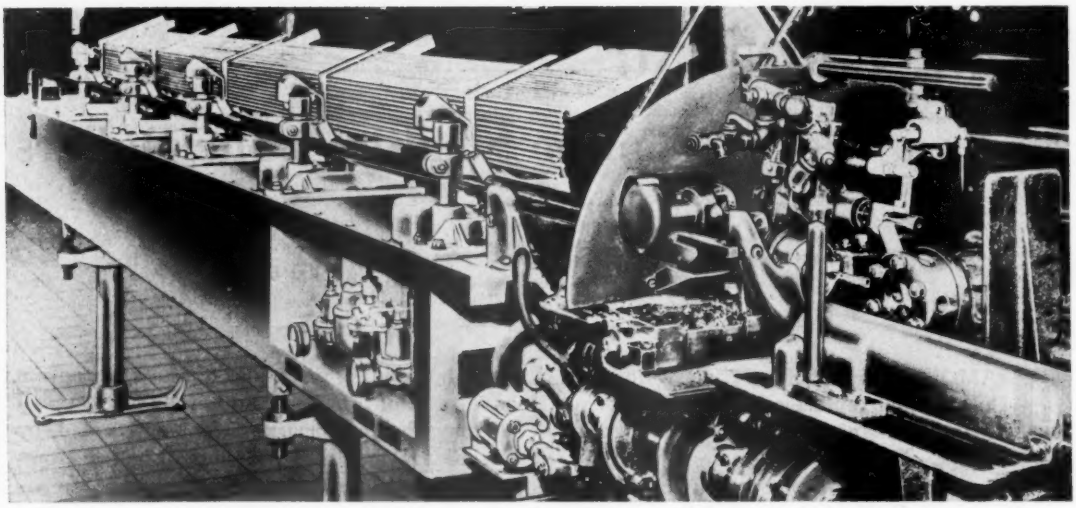
With a program built upon these recommendations, you will be certain of getting the most out of conventional practices established over many years. You will have a solid basis for evaluation of new techniques, and for introduction into the program of those that will produce appreciable savings in tool or wheel costs, or in grinding time.

In addition to the well-received abrasive-belt grinding technique, recent noteworthy developments include The Sheffield Corporation's Cavitron ultrasonic machining process (see "Ultrasonic Machining . . .", T & P, July '53, p. 56); Metalloid heat-limiting fluids and vapor application (see "400-900% Increased Tool Life", T & P, Oct. '53, p. 60); the sliding subtable or floating protractor on freehand grinders (see "Use of Sliding Sub-Tables . . .", T & P, Feb. '54, p. 60); liquefied carbon dioxide (see "CO_2 Freeze Grinding", T & P, Feb. '53, p. 35); plunge grinding (see "Diamond Wheel Life Extended . . .", T & P, Oct. '52, p. 88); and electrolytic grinding (see "An Evaluation of Diamond-Substitute Process", T & P, Feb. '53, p. 58); and there are many others.



One of the most notable of the new carbide grinding developments is the use of abrasive belts for freehand grinding of single point tools. This technique has economically replaced silicon carbide wheels within a certain range.

Photo, courtesy of Hammond Machinery Builders, Inc.



The answer to machines running without stock, lost production, and lost man-hours in departments whose operators still load each bar by hand is—the Automatic Magazine Loading Bar Feed.

Increase Production on Your

AUTOMATIC SCREW MACHINES

TOO OFTEN, top management doesn't know that automatic magazine loading bar feed equipment removes two problems that continually harass their machine shop supervisory personnel and cause unnecessary operating costs:

1. Automatic screw machines running without stock, and

2. Excessive time consumed in manual loading of bar stock into the machines.

Standard, pneumatically-operated, Lipe-Rollway automatic magazine loading (AML) bar feeds eliminate these frequent loadings by hand, feed bar stock continuously for periods up to eight hours and more, increase production output of Brown & Sharpe type automatic screw machines by at least 50%, and have literally paid for themselves within a year.

In addition to most types of single-spindle automatic screw machines, the AML bar feed is also applicable to abrasive saws, cut-off machines, punch presses, and centerless grinders.

Once installed, the AML bar feed requires virtually no additional set-up time when changing from one job to another. This is no more than 5 to 10 minutes. Therefore, long and short production hours are equally as easy and efficient to handle. Furthermore, all runs are operated without using feed fingers.

The AML bar feed is actuated by a system of air valves and cylinders. Its operation is fully automatic and interlocked with the indexing cycle of the machine.

Bar stock is racked in a magazine along one side of a split stock-bar tube, the lower half of which slides backward to receive the bottom bar from the magazine. Then, the lower half of the stock-bar tube moves forward, carrying the bar, to close the stock-bar tube. A stock pusher, inside this tube, advances the bar through the machine spindle and collet and positions it for the first cut-off operation.

With the stock bar positioned for cutting off to proper length, the machine clutch is automatically engaged, the collet grips the stock bar, and the machine is in full-cycle operation. As each piece is cut off, the bar is automatically advanced. Feed-out lengths are accurately held, since the pusher action prevents any rebound of the stock bar from the stop. In a single feed-out operation using a standard second-operation clutch on the machine, the feed-out may be of any length.

When the bar being machined is used up to the end remnant, the machine clutch automatically disengages and the machine tool cycle stops with the spindle revolving and the collet

open. The stock pusher is retracted, the stock-bar tube opens to receive one bar released from the magazine, the bar drops into place and the tube closes.

The stock pusher then feeds the new bar through the spindle and collet into position for length. In moving into position, the new bar automatically ejects the remnant from the last bar. The machine clutch is engaged, and the machine is again in its normal full-cycle operation.

The entire reloading of the stock-bar tube and positioning of the bar for the first cut requires about four seconds—entirely without operator attention.

Regardless of model, the magazine capacity for stock 12′ long or less ranges from 19 bars of ⅝″ dia. to 96 bars of ⅛″ dia. Random lengths can be utilized without any appreciable effect on production, due to the fast reload time offered by the AML bar feed. Stock is kept off the floor, clean, dry, and ready for use.

Operators are left free to devote more attention to the tooling, machine operation, inspection, minor repairs, and preventive maintenance of a greater number of machines. Moreover, although usual practice calls for one man to operate three to four automatic screw machines, the efficiency of the AML bar feed allows one operator to handle as many as 10 machines.

Normally, the AML bar feed must increase production by 30% to justify its installation. In actual shop application, however, the addition of this unit to a Brown & Sharpe automatic has often increased production by 100% or better. This increase, of course, varies according to the length of the workpiece and the rate at which the stock is used up.

When the machine operation cycle is a short one, such as 1½ to 3 seconds, and with a long feed-out or workpiece 1¼″ or more in length, the stock bar is used up rapidly. Here, stock loading time takes on greater importance.

At L. C. Smith Company, Inc., Syracuse typewriter manufacturer, a management-sponsored comparison of running time on a group of manually-loaded screw machines and an automatic screw machine equipped with an AML bar feed doing similar work, revealed a net gain of 78% in running time for the latter.

The big saving, of course, comes in gross production because of eliminating the big problem—machines running without stock until an operator sees the need and is able to reload the machine.

Degree Of Doneness

THE NEW hermetically sealed Dial Roast Meat Thermometer, recently introduced by Taylor Instrument Companies, met with a big demand from housewives—as was anticipated. The new cooking aid has a pointed stainless steel stem which, inserted into a roast, accurately indicates internal meat temperature, or "degree of doneness", on a large, easy-to-read dial.

The screw machine department was assigned the goal of producing 5,000 thermometer stems a day.

One automatic screw machine was set aside to cut off and burr 4¾″ lengths of ¼″ stainless steel tubing from stock 10′ and 12′ long. This machine was equipped with a conventional pusher-type feed tube that required four push-outs per piece to feed stock through the machine collet to the stock stop.

Ordinarily, the regular operator would be responsible for this machine but, due to the need for sustained production, he was assisted by an apprentice. The operator would load the machine (one bar at a time), start the machine, wait until the stock had been consumed, stop and reload the machine.

This arrangement enabled the department to meet and maintain a round-the-clock production quota of 216 thermometer stems per hour. The feed finger, however, frequently scratched the highly finished stainless steel. It also was necessary to frequently replace feed fingers and feed pads.

Consequently, the manual feed finger method was discarded in favor of a Lipe automatic magazine loading bar feed.

The installation of this unit allowed the apprentice to return to other jobs in the screw machine department, since the regular operator could now—without any delays—tend the machine as part of his battery. In addition, production was upped to 267 stems per hour . . . an increase of 24% over the manual feed method . . . an increase in the "degree of doneness".

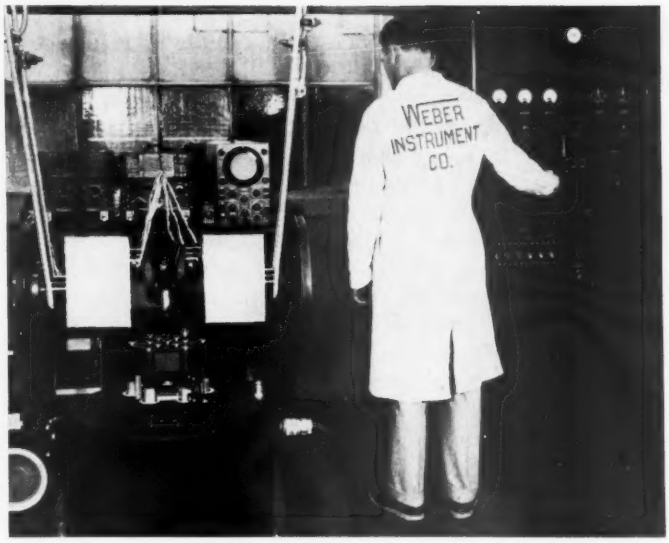


Fig. 1. Crankshaft failures were produced by vibrating each specimen near resonance, using an MB shaker and end weights on shaft under test.

ENDURANCE STRENGTH . . .
Nitriding vs. Shot-Peening

BECAUSE OF THE GREAT INTEREST being shown today toward increasing the fatigue strength of highly stressed parts and toward the reduction of weight, a recent testing program conducted by Weber Instrument Company is of timely importance. This study was undertaken to determine the fatigue-life relationship between nitriding and shot-peening, on an automotive-type crankshaft.

The two types of test specimens were: 1. Induction (Tocco) hardened SAE 1046 with shot-peened fillets, and 2. Nitrided SAE 4140. Average physical properties were as follows:

	SAE 1046 SHOT-PEENED FILLETS		SAE 4140 NITRIDED	
			(Core)	
Hardness	260	BHN	300	BHN
Tensile Strength	113,400	psi	131,300	psi
Yield Strength	76,500	psi	102,400	psi
Reduction in Area	62.6	%	59.7	%
Elongation	25.8	%	20.2	%

It was desired to fail as few specimens as possible in establishing the endurance limit, i.e. the stress below which unlimited crankshaft life could be expected.

A stress level which would produce crankshaft failure in the 200,000 to 1,000,000 cycle band was found by trial and error. At this level, several crankshafts were failed in fatigue (Fig. 1) in order to establish as closely as possible the endurance scatter band. On the basis of these data and the static physical properties of the test materials, the endurance limit was determined with a reasonable degree of accuracy by extrapolation. Data from similar tests on comparable material served for guidance. More data points were run on these other tests than were thought practical on the crankshafts.

The S-N curves for the two processing methods (Fig. 2) are plotted from data presented in Figure 3.

Endurance limits were established as ± 62,000 psi for the induction hardened and shot-peened SAE 1046 crankshaft, and ± 102,000 psi for the nitrided SAE 4140. The final conclusion, then, was that the endurance limit of the nitrided SAE 4140 is 1.65 times that of the induction hardened and shot peened SAE 1046.

Test Details

Crankshaft failures were produced by vibrating the crankshaft near resonance (Fig. 1). For this, an MB (Type C-5H) Shaker was employed. The crankshaft itself was suspended by means of rubber shock cords. A mechanical fuse was introduced to protect the shaker table from excessive side loads.

The national frequency of the crankshaft, the two end weights, and the shaker table was

approximately 91 cps. The weights were added to bring the resonant frequency down to a more usable range. The shaker frequency used was 87 cps, and the proper stress amplitude was then obtained by shaker force adjustment.

The tests were monitored by means of strain gages. Type AD-7 strain gages were cemented to the center of No. 2 and 3 crankpins on each crankshaft. Because of equal stress, either strain gage could be used. Both were installed, however, as a safeguard against failure of one.

All crankshafts tested, except one, failed in either of the two crankpin fillets adjacent to the center main journal (see Fig. 3). Just one failed in a center main journal fillet.

In order that the data could be interpreted in terms of fillet stress, the stress ratios between the center of the crankpin and the points of failure in the fillets were measured by means of strain gages (Fig. 4). A determination of the biaxial stress condition in the fillets was necessary to obtain the true fillet stress.

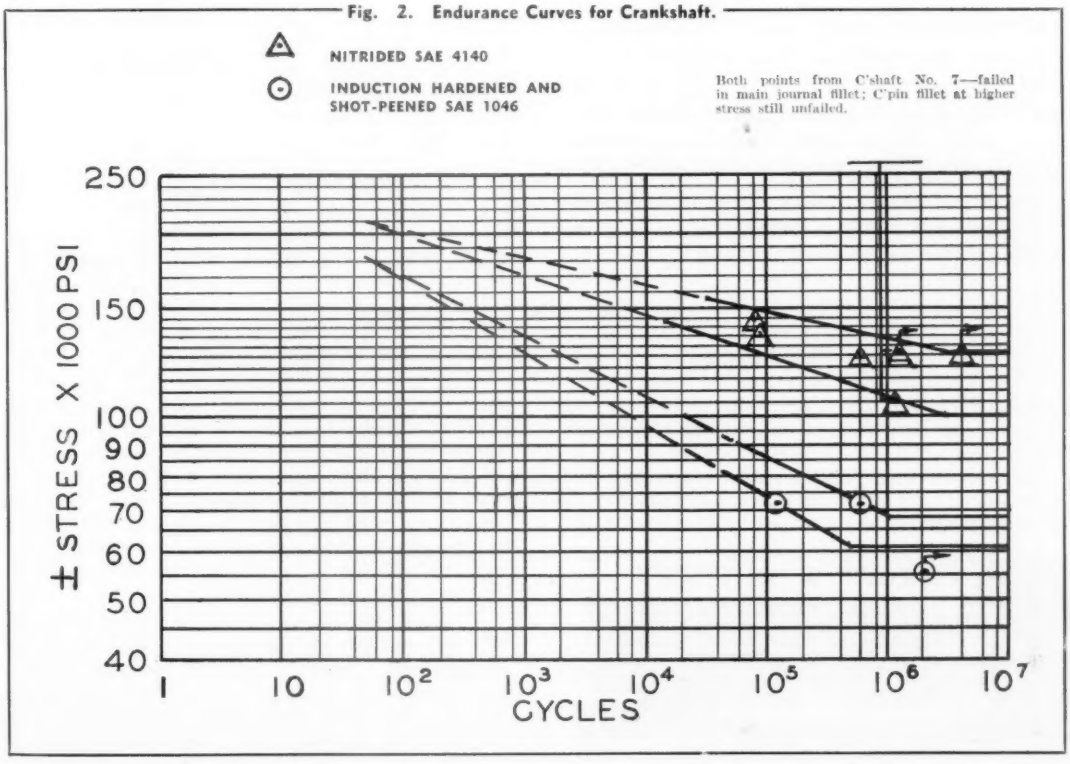
Discussion of Results

For the shot-peened crankshafts, the test stress used to establish the scatter was ± 72,500 psi. Only two points were run at this level, since only four peened shafts were available and two were needed to establish the proper test stress. It will be noted that specimen No. 2, tested initially at ± 56,000 psi while searching for the proper test stress level, completed 2,031,000 failure-free cycles at slightly below the established endurance limit of ± 62,000 psi.

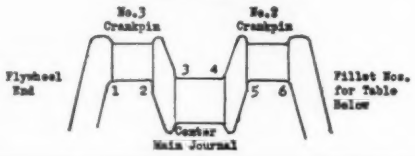
In the case of the nitrided specimens, a test stress of ± 128,000 psi was used. At this level the desired three specimens were tested. One specimen failed in a crankpin fillet at 600,000 cycles; another completed 4,000,000 failure-free cycles. The third specimen also ran a large number of cycles without failure in the crankpin fillets. However, at 1,175,000 cycles failure occurred in a center main journal fillet. The stress at this point was checked and found to be 85% of that in the crankpin fillet. Apparently, some material or processing defect dropped the material strength in the main journal fillet sufficiently to overcome the difference in stress and, thus, produce failure in this lower-stressed region.

According to Robert Stephens, the Weber Instrument test supervisor, "It is actually this one point on the S-N curve that determines the magnitude of the endurance limit. It shows that, if enough specimens were tested at ± 128,000 psi stress, failure in the crankpin fillet would probably eventually occur at around 100,000 cycles when the same material weak-

Fig. 2. Endurance Curves for Crankshaft.



FATIGUE TEST DATA



Specimen Number	Description	Stress Amplitude	Cycles to Failure	Location of Failure
1	Shot Peened SAE 1046	± 88,000 psi—No. 1 & 6 Fillets Up to tensile strength in No. 2 & 5 Fillets	Probably failed in first cycle	No. 5 Fillet
2		± 56,000 psi—No. 2 & 5 Fillets	No failure 2,031,000	
3		± 72,500 psi—No. 2 & 5 Fillets	125,000	No. 2 Fillet
4		± 72,500 psi—No. 2 & 5 Fillets	605,000	No. 5 Fillet
5	Nitrided SAE 4140	± 148,500 psi—No. 2 & 5 Fillets	80,000	No. 2 & 5 Fillet
6		± 140,000 psi—No. 2 & 5 Fillets	90,000	No. 5 Fillet
7		± 128,000 psi—No. 2 & 5 Fillets ± 109,000 psi—No. 3 & 4 Fillets	1,175,000	No. 4 Fillet
8		± 128,000 psi—No. 2 & 5 Fillets	600,000	No. 5 Fillet
9		± 128,000 psi—No. 2 & 5 Fillets	No failure 4,000,000	

Fig. 3. All crankshafts, except one, failed in a crankpin fillet adjacent to center main journal.

ness appeared in this fillet. It is believed, however, that this condition represents very nearly the worst to be expected. Thus, it was not thought practical to test further specimens at ± 128,000 psi, but rather to allow the main journal failure point to establish the endurance limit as shown. It will be noted that the two points initially run at a higher stress fall within the scatter band so established."

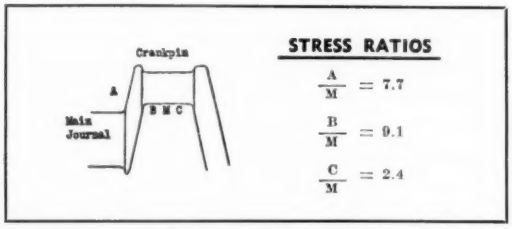


Fig. 4. Stress ratios between center of crankpin and points of failure.

PRATT & WHITNEY RELOCATES BRANCH OFFICE

Pratt & Whitney, Division Niles-Bement-Pond Company, West Hartford, Connecticut announces the relocation of its Los Angeles Branch Office in new, larger quarters with adequate parking for visitors at 3016 East Olympia Blvd., Los Angeles 23.

Specially planned and erected to provide better facilities for the growing West Coast industrial market, the new office will carry a more comprehensive Los Angeles stock of regularly listed P & W Cutting Tools and Gages and give added office area for the factory-trained sales and service personnel associated with the large line of precision machinery tools, cutting tools and gages produced by Pratt & Whitney and its subsidiary, Potter & Johnston Co. of Pawtucket, R. I.

The new office is under the management of Daryl W. Callen, District Manager and will include P. D. Brown and Clifton S. L. Elk, machine tool sales engineers; Victor Stanley and Howard A. Small, cutting tool and gage sales, Robert W. Conran, Kellerflex sales and R. C. Losey, office sales.

Application and Design of Blanking Dies

Taken from the 4th Edition of* "DIE DESIGNING AND ESTIMATING"

This discussion is continued from the June, 1953 issue, which covered basic design factors, types of blanking dies, and general recommendations on design of die parts.

DROP-THROUGH TYPE BLANKING DIES

The drop-through die (Figs. 3-3 and 3-15) consists essentially of the die block, punch, stripper, front and back stock-guides, stock strip, and die set. The die opening leads clear through the die half of the assembly and the blank either falls through of its own weight or is forced through by succeeding punchings.

Unless there is no opening in bolster plate or press bed or unless there are accessories within the bed which would interfere, the blanks can fall right through the bed into a tote box or chute. Otherwise, the die set is mounted on rails that are partially cut away to permit blanks to slide off (on inclinable presses) or to be pushed out of the operating area (on straight-sided presses).

In blanking from unit stock on inclinable presses, the scrap is easily stripped from the punch and also slides off the back of the press. A conveyor or chute arrangement is thus needed to direct scrap and blanks into separate tote-boxes.

Some of the component parts of this drop-through die require certain considerations beyond those previously mentioned. These are covered in the following paragraphs.

* The popular Dannes & Bohmer textbook, "Die Designing and Estimating", is in the final stages of being thoroughly revised and enlarged. Copies of this book will be available for purchase at an early date. The material preprinted here represents an extensive revision and expansion of the original text on the same subject. — W.N.N., Tech. Ed.

Fig. 3-15. Drop-through die—lower half.

Die Block

In a die where the blank drops clear through, it is essential to provide side walls of the die block opening with sufficient relief or taper (Fig. 3-16). Lack of sufficient relief will result in the blank becoming bowed or concaved or acquiring a heavy burr as the blank meets resistance along the side walls, with the punch and succeeding blanks forcing it on through.

Soft metals tend to swell more rapidly after being cut, and dies for blanking such materials as copper, brass, and aluminum should be provided with a relief beginning at the cutting edge. On steel, the side walls should be vertical below the cutting edge for a distance at least equal to

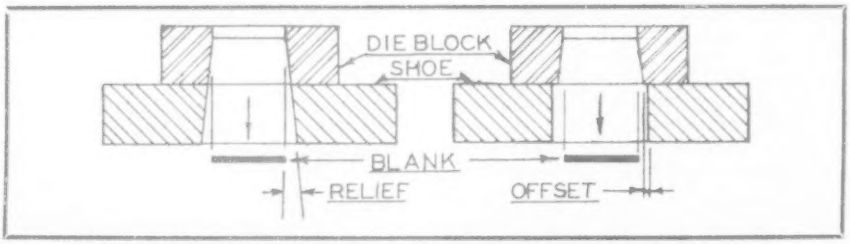


Fig. 3-16. Two methods of relieving blank openings in the die shoe to prevent blanks from jamming.

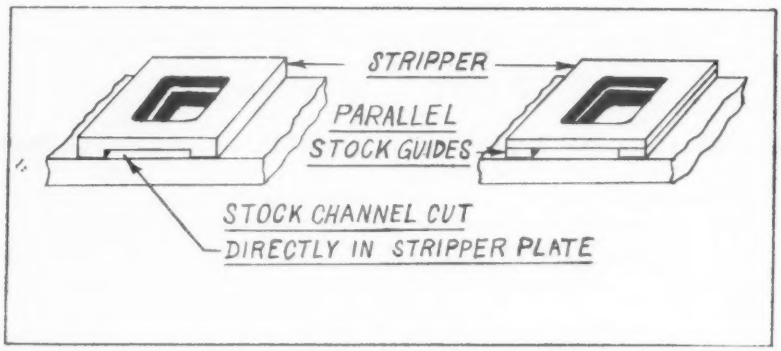


Fig. 3-17. Two common types of stationary strippers.

stock thickness and not less than ⅛". This land permits a greater number of regrinds on the die blocks.

On small dies, the angle of relief should be from ¼° to 1°; on average dies, from 1° to 2°; and, on large dies, from 2° to 3°. In the case of soft metals, the relief can be slightly more liberal. The closer the tolerances on the blank, the less the relief which can safely be provided.

As the top surface of the die block is ground down to remove effects of wear, relief which starts at the cutting edge will cause the die opening to increase in size. This increase will, however, be very slight and will not appreciably affect blank dimensions until a number of regrinds have been made.

Die Shoe

The die opening in the block for passage of blanks must be continued on through the shoe. If the shoe is a casting, this hole should be cored in slightly larger than the blank size.

Some designers extend the side wall relief of the die opening into the block, while others prefer making the opening in the shoe about ⅛" larger per side than the relieved end of the die-block opening (Fig. 3-16).

The former method requires careful alignment of tapered walls on the shoe with those on the block, in order not to leave a ledge which would interfere with free passage of blanks. On small precision dies, such care can be taken but, on average work, an offset—although not ideal—will be safer since slight misalignment of block and shoe will be permissible.

On most dies, such accessories as stock-guides and stops are mounted on the shoe. On others, these parts are mounted on the retainer.

If there is any reason why blanks cannot drop on through the bolster and die bed, a channel must be provided for the blanks to slide or be pushed out of the die. This channel can be machined in the bottom of the shoe, or the shoe can be built up on rails or parallels, with one being cut away for the blank outlet.

Usually, the channel extends from the drop-through opening toward the rear of the press with an ejector hole provided through the front of the shoe in line with this channel. In an up ight press with stock feeding from right to left, the channel can be toward the left with the ejector being automatic and synchronized with the feed.

Punch

The punch length must be sufficient for it to descend far enough into the die opening to insure the blank being cleared from the mouth of the die.

Stripper Plate

In the simple blanking operations, the stationary type of stripper (Fig. 3-17) is usually preferable. The stripper can be elevated over the die block by one of two methods: (1) by using a thick stripper block, undercut to provide a channel for passage of the stock, and (2) by mounting the stripper plate directly upon the front and back stock-guides.

A stationary stripper has the disadvantage of hiding the work from the operator's view. This becomes most acute in blanking large areas on vertical presses and in various hand-fed operations, particularly those utilizing scrap stock where centering is done visually and those operations using two-pass layouts where the blank openings in the second row must be accurately centered in relation to those of the first.

On inclined presses, a sight-hole can be cut along the front of the die

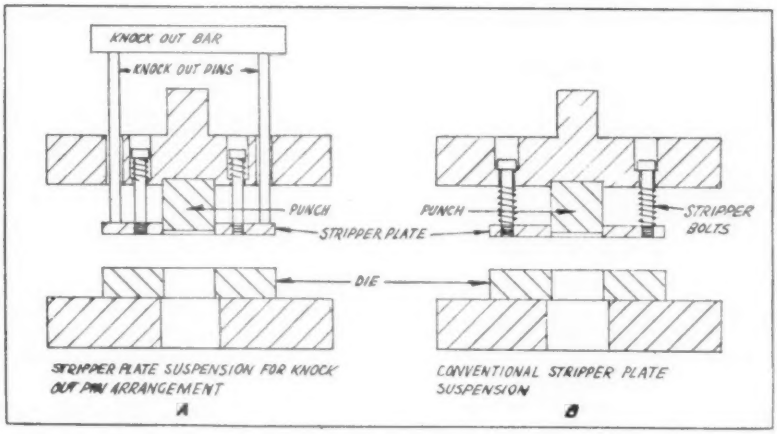


Fig. 3-18. On dies for inclinable presses, it is common practice to utilize the knockout provisions in the press for actuating the stripper.

through the front stock-guide. On vertical presses, the stripper plate can be cut away to reveal the stock stop. In some cases, particularly on light-gauge stock and on inclined presses, the front stock-guide can be omitted.

A fixed stripper plate should be left slightly short of the end of the stock-guides—on the loading side—to permit the operator to see the end of a new strip being fed into the die.

Where sheet or unit stock is used on large blanking operations, a fixed stripper would interfere with removal of the scrap strip. Here, and on other operations where a stationary stripper would be impractical, a spring-loaded stripper plate suspended from the punch holder would then be advisable, unless stock is too heavy in relation to the area and available spring pressure would not be sufficient.

The spring-pad type of stripper is also employed on thin-gauge, highly-ductile materials where it is desirable to utilize the pad pressure in holding surrounding stock during the blanking action. Here, the stripper plate is mounted over compression springs seated in the punch holder and suspended by bolts with the lower stripper surface below the cutting end of the punch when the die is open.

As the ram stroke begins, the stripper plate contacts the stock strip before the punch does and holds the stock until the punch passes on its return stroke. A side benefit is the smoothing out of stock irregularities by pressure of the pad.

As the punch rises, spring pressure holds the scrap, stripping it from the punch. Scrap is held to the extent of the free travel in the stripper holding bolts, at which point the spring-pad is lifted by the ram and stock is free to be advanced.

When designing dies specifically for use on inclinable presses, knockout arrangements are usually employed for positive stripping action (Fig. 3-18).

The stripper plate (A) for knockout operation is normally in a retracted position, inasmuch as the spring action is opposite to that in conventional dies for upright presses (B). This normally retracted stripper position has quite a number of advantages, as follows:

1. Ease of die sharpening.
2. Elimination of stripper bolt adjustment.
3. Ease of setup.

The case of die sharpening should be obvious. With the conventional die (B), it is necessary to dismantle the stripper plate in order to sharpen the die. After sharpening the die, it is necessary to readjust the stripper bolt length by the use of washer shims; otherwise, the stripper plate would project too far in relation to the sharpened member.

Since the stripper plate (A) is normally retracted, it is unnecessary to dismantle the stripper plate for the sharpening operation.

The retracted position of the stripper plate (A) similarly eliminates the constant stripper plate adjustment problem. In the inclined press, the adjustment becomes a function of the setting of the adjustable knockout bar.

In both (A) and (B), it may ultimately be necessary to replace the stripper bolts. As the die approaches the last stage of its life, it may have become shortened to the extent that the stripper bolt heads strike the face of the ram. However, the necessity for such replacement is much less frequently re-

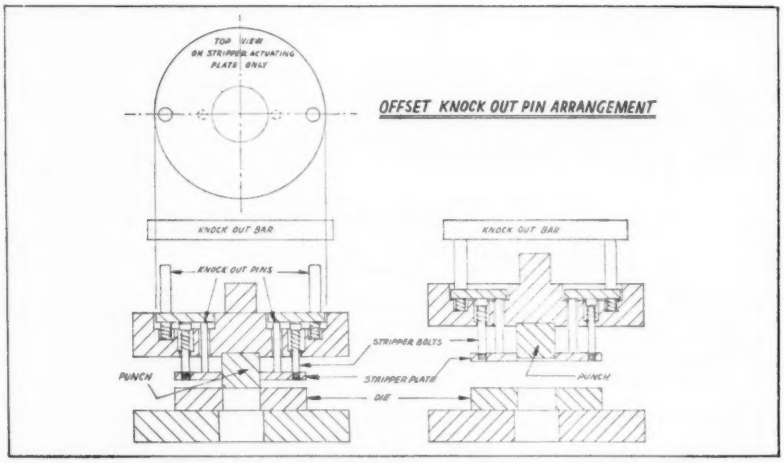


Fig. 3-18a. An offset knockout pin arrangement that employs an intermediate stripper actuating plate, is used on jobs where point of required pressure does not coincide with knockout pin holes in the ram.

quired in the knockout-type die (A) than in the conventional die (B). The reason for this is that the stripper bolt length in (A) can be such as to give a maximum retractable movement. In (B), however, the retractable movement is limited by the amount of compression that can be applied to the stripper springs.

When a guide-post type of die set is used, it will make little appreciable difference whether knockout pins or conventional stripper springs are used, as far as the setup is concerned. However, if the die set does not have guide-posts, the conventional method of setting up is to employ the punch and die as a means of alignment. This is not too practical, but it is common shop practice. The difficulty is that there is little or no assurance of uniform clearance between the punch and die. The main point, however, is the fact that the conventional spring-operated stripper (B) prevents engagement of the punch and die, thus making it difficult, if not impossible, to set up unless guide-posts are used.

In the knockout-type die (A), however, the stripper plate is normally retracted and this permits engagement of the punch and die for the purpose of setup.

Under some circumstances, the normally retracted stripper plate (A) can be a disadvantage. Operations that require a pressure pad to keep the work from being deformed during impact, must use the general method of plate suspension (B). The normally retracted stripper plate (A) does not function as a pressure plate.

Knockout pins must extend through existing holes in the ram. Very frequently, some means must be devised to provide the desired stripping action at a point that does not coincide with any knockout pin position. In such instances, an offset knockout pin arrangement (Fig. 3-18a) with an intermediate stripper actuating plate can be employed.

Stock-Guides

The front and back stock-guides, if used to support a stationary stripper plate, must be uniformly thick along their entire length to ensure that the lower surface of the stripper plate will be held parallel to the upper surface of the die block.

The stock-guide thickness must also be sufficient to hold the stationary stripper plate at the proper height to permit free advance of the stock strip.

Although this thickness should be kept to a minimum, it should not be less than 1½ times stock thickness nor less than the height of shear if applied to either punch or die. If a fixed end gage or stop is used, the stock-guides must be sufficiently thick to permit raising the stock and sliding it over the stop.

When a fixed stripper plate is employed, an automatic stop will permit leaving the vertical clearance between die and stripper less than twice stock thickness. This is an advantage, in that it will prevent the end of a new stock strip from climbing over the old strip.

When spring-pad strippers are used, the stock must be guided by strip-type guides outside the area contacted by the stripper plate when die is in its closed position, or by gage pins backed by springs which will allow the pin to be pressed down into the die shoe as the die closes; or, clearance holes for fixed pins must be provided in the stripper.

INVERTED-TYPE BLANKING DIES

The principal uses of the inverted-type blanking die have been described previously. In this die (Figs. 3-4 and 3-19) the punch and the die block are transposed, the punch becoming the lower stationary member and the die block the upper moving member.

With the tools inverted in this manner, the blank is punched upward out of the stock strip instead of downward as in the drop-through die. Thus, the scrap is forced down around the punch and tends to stay there, while the blank usually tends to stick in the mouth of the overhead die block.

These conditions necessitate provision for clearing the scrap and the blank from the positions described. Briefly, a spring-pad stripper attached to the lower shoe lifts the scrap from the punch and a knockout arrangement ejects the blank from the overhead die opening.

In general, the inverted die is used for production of large, heavy blanks on upright presses or for small blanks on inclinable presses. In the former class of work, the blank frequently falls back into the scrap strip and must be shaken out; usually two operators are required. On small work, air is usually employed to blast the finished piece to the back of the press.

Small and even medium-sized blanks can be economically produced from either unit or strip stock, using inverted dies on inclinable presses (Fig. 3-20). When the blank is shed from the die opening, gravity carries it off the back of the press.

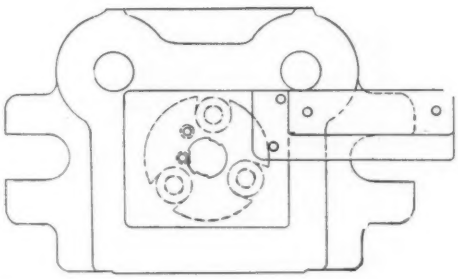


Fig. 3-19. Inverted die — lower half, showing punch mounted on the die shoe.

A simplified inverted die consists of the die block, punch, stripper, stock-guides or pins, stock stop, die set, and also the shedder or knockout. General principles of construction will apply except for those points mentioned in the following paragraphs.

Punch

The punch need only enter the die opening far enough to completely fracture the stock, since the blank will be returned back out of the die opening.

Unless the blank area is quite large, the punch is provided with a sizable base shoulder (Fig. 3-19). In turn, the base is provided with spring pockets or recesses for the stripper, gage pins, and stock stop.

If the blank area is sufficiently large, the punch should be made sectionally in order to economically provide the

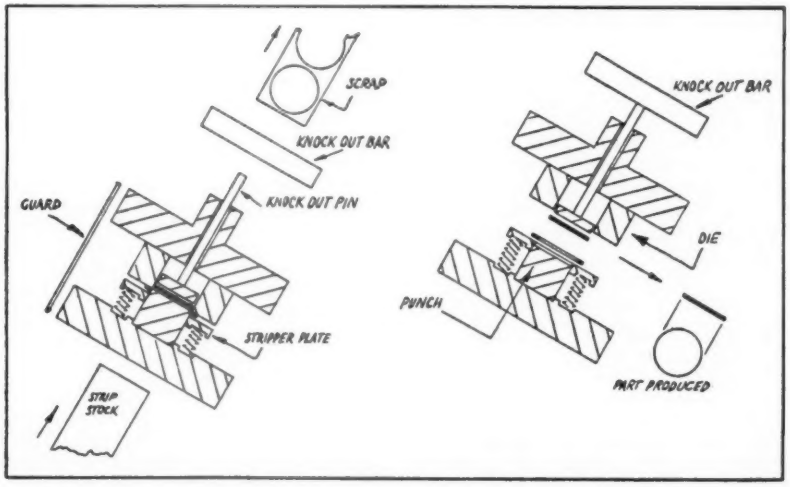


Fig. 3-20. Inverted die for inclinable-back presses. The die shown is intended for operations on strip stock, although it is sometimes possible to adapt it for both strip and unit stock.

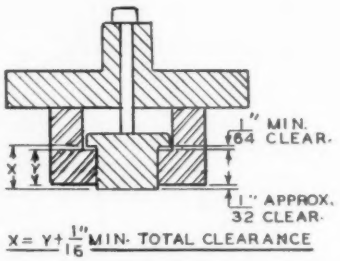


Fig. 3-21. Knockouts must be dimensioned so as to avoid shoulder fractures.

height necessary because of the stripper assembly.

Die Block

It is unnecessary to provide a relief along the side walls of the die opening on an inverted die, since the blank is shed from the opening immediately after being severed.

In some cases, a recess or step is machined into the upper end of the die opening for retainment of the shedder.

If a spring shedder is to be employed, an intermediate part should certainly be provided between the die block and the upper shoe, in order to provide space for the shedder assembly without cutting too deeply into either block or shoe.

Stripper

The spring-pad type of stripper is always employed and is secured to the punch base or lower shoe by means of shoulder bolts, with compression springs equally distributed and of such strength as is necessary to strip the scrap from the punch—usually from 10% to 20% of the blanking pressure.

When the die is open, the upper surface of the stripper plate must be held by spring-pressure, but limited by length of stripper holding bolts, at a level roughly from ⅛" to ¼" above the uppermost point of the punch.

Since the stripper plate must support the stock while being fed, the upper surface should be machined and preferably ground.

Stock-Guides and Stops

The most commonly used type of gage pins are of spring construction. They are properly located in the stripper and should be of the compression type for best results. As stated previously, provisions for the spring must be made in the lower shoe. To prevent the pin from coming out, it is always shouldered beneath the stripper, the spring supporting the shank of the pin, the upper end of which extends above the stripper surface about ¼". As the die descends, the pin travels down without interference, thus permitting uninterrupted cutting and a solid die surface unweakened by clearance holes that would otherwise be necessary.

The number of gage pins varies with the length of blank. One spring-type pin in the stripper, and a solid pin mounted into the shoe, beyond the die and stripper, are usually sufficient. In some instances, more guidance is required and may be obtained by a method as illustrated. These pins are used for stock gaging or guidance and determine the amount of scrap on the sides.

Stop pins are of the same construction as the gage pins and must be located properly to allow sufficient amount of scrap between blanks. However, pins are not the only method used for stops; an automatic arrangement may be made. It is identical in construction and principle to the stop used in the drop-through die with the exception that the mounting and direction of vertical travel are reversed.

Knockouts

In general, a **stripper** is employed to remove stock from around a punch, die, or other components; a **knockout** (Fig. 3-20) is used to shed or eject stock from within a die cavity. The knockout may be actuated by springs or by a positive-acting knockout pin and bar arrangement.

Some designers prefer to call the ejecting plate a "shedder" or an "ejector". The current trend, however, is to refer to the internal ejecting plate as a **knockout,** to the offset jigger pin or oil breaker pin or spring stripper pin as a **shedder,** and to a side-acting device for removing the blank as an **ejector.**

The knockout, in an inverted die, may be of the (shouldered) flange type or the straight type construction, depending primarily upon the size of the blank. In small dies the knockout, usually of hardened tool steel, is the flange type. It is machined and finished to a slip fit in the die opening and retained or prevented from dropping out by the flange. The knockout should be dimensioned, from the working surface to the shoulder (Fig. 3-21), not less than 1/16" greater than the mouth thickness of the die, as measured from the working surface to the recess or undercut. This is necessary in obtaining proper blank ejection. A shedder or spring pin should always

be incorporated in the knockout, to prevent blank adherence due to oil or other substances. In an inclined press, the blank will fall toward the back of the press. In an upright press, the spring pin must be located off center so as to properly direct the blank's fall. An air blast is then used to complete removal of the blank.

Various types of positive knockout pin arrangements may be used, depending upon the shape and size of blank and the pressure required for the ejection. This is more fully discussed in the chapter on Combination and Compound Dies. The knockout rod usually leads through the shank. It may be a single bar or rod or a double rod fastened to a pad above the shank, or a single rod with an extension beneath contacting the knockout, as may be suitable for the particular die under consideration. Regardless of type used, the following must be observed:

1. Adequate strength.
2. Equal distribution of striking points and provisions for proper movement or travel.

The plain or straight-sided knockout is used in medium and large dies where the shoulder construction would be impractical. It is generally either of cold rolled or machine steel, machined to a slip fit in the die opening, and held in position by shoulder screws. If the die is of medium size where a positive knockout pin arrangement can be used, ejection is accomplished in this manner. However, if the die is very large, ejection is usually accomplished by means of springs inserted under the knockout. Here again care must be taken to provide enough travel in both screws and springs.

RETURN-BLANK TYPE BLANKING DIES

When advisable to use the inverted type of die construction but necessary to perform the operation on large upright presses, it is preferable to go one step further and insure that the blank will be returned into the scrap strip opening from whence it came. This permits the blank to be carried along with the scrap out of the die.

An auxiliary device can then be employed to knock the blank out of the scrap strip, or else the strip can be shaken to remove the blank. On long and narrow blanks, the strip can be passed over a roller mounted on the end of the press, the roller being elevated slightly and shorter than the blank dimension across width of the stock. This will pop the blank out of the strip.

Return of the blank is usually achieved by means of a spring pad (Fig. 3-22). Here, as the ram makes its return stroke, the spring pressure behind the pad forces the blank out of the die mouth and back into the scrap strip.

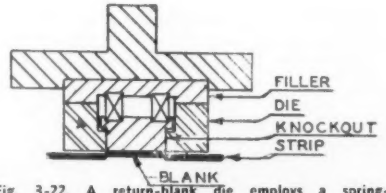


Fig. 3-22. A return-blank die employs a spring-mounted knockout that maintains constant pressure on the blank, forcing it back into the scrap strip to be carried on out of the die by advance of the strip.

Figures 18, 18a, 20, and those recommendations pertaining specifically to inclinable presses have been adapted from J. I. Karash, Reliance Electric & Eng'g. Co., TOOL & DIE JOURNAL, June '49 through Feb. '50.

DIE DESIGNING and ESTIMATING, 4th Edition

For many years, DIE DESIGNING and ESTIMATING has been a best seller and, for too long a time, has been sold out. It has been widely used in schools and apprentice programs, for both classroom and on-the-job training, and by diemakers and die engineers as an authentic reference and refresher.

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There are greatly expanded chapters on blanking, piercing, and cut-off dies, bending and forming dies; to the chapter on drawing a chapter has been added on deep drawing; other added portions cover temporary and short run dies, selection of die materials, with many new pages devoted to job planning, stock layout, and press tonnage determinations.

The new 4th edition of DIE DESIGNING and ESTIMATING is destined to continue as an invaluable die engineering tool; encyclopedic in scope, authentic in source material, and thoroughly proved as a most practical shop text and teaching aid.

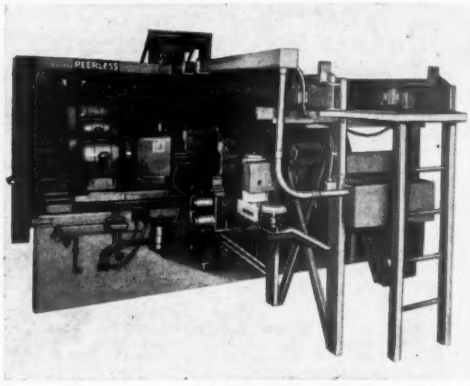
New Turret Punch Press Uses Pantograph Principle

INCORPORATING a pantograph for rapid hole location, the model RA-61 Wiedemann turret punch press effects substantial time and labor savings for short run piercing operations. The metal is quickly and accurately located in the press by positioning a stylus on a color coded template prepared for the job. Up to 20 different punches and dies are available for use as required. While the maximum punch and die size is 6" in diameter, larger openings are easily produced by a combination of "hits". The Wiedemann RA-61 can produce holes up to 1½" diameter in ⅜" steel and up to 6" in ⅛" mild steel.

Photo courtesy of Wiedemann Machine Co.

Transfer Machine Replaces Entire Department

THE VERSATILITY of the latest Peerless transfer machine permits various differential carriers to be processed on a single machine. It reportedly accomplishes all the work formerly done by a complete department of several machines and operators.



Photos courtesy of Peerless Production Co.

This machine takes the raw cast carriers, roughs and finishes them, and then completes rough-and-finish boring and facing operations as well as drilling and tapping. Even with such diversified work, it still holds precision boring and facing tolerances.

Now operating in one of the nation's largest axle plants, the machine can process 40 heavy truck-axle carriers per hour through eight stations — five working, one load and unload, and two idle. The transfer mechanism is hydraulically actuated.

Tooling in this machine includes single-place fixtures with power clamping, fixed center ball bearing drill heads, and an individual lead-screw tapping head. Another feature is the power operated overhead return conveyor and elevators. The hydraulic feed unit used on this machine is the Peerless 17"-way floor type, and the bore-face head also is a Peerless hydraulically-actuated unit. Operational checking is done from a central control panel.

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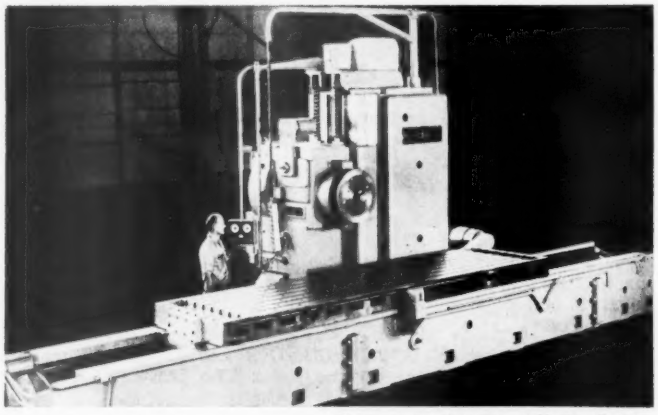

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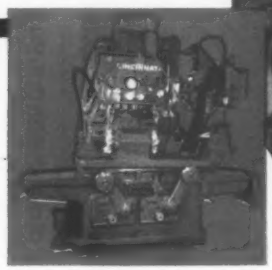

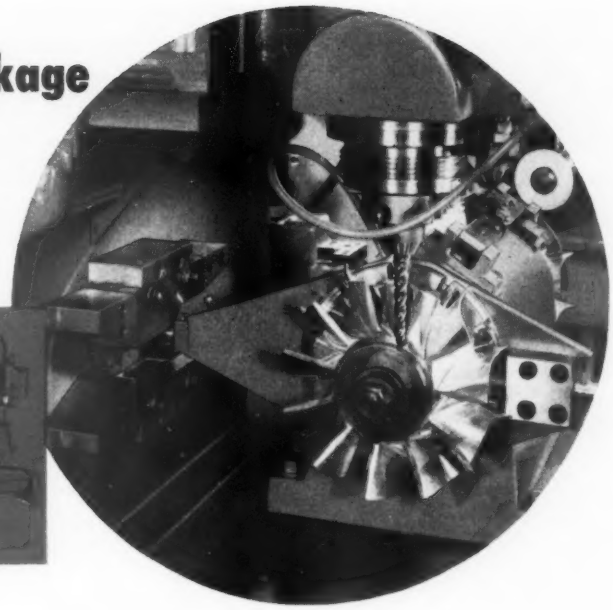

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ELECTROLYTIC PREPARATION OF MOLYBDENUM

Successful electrolytic preparation of molybdenum— a critical refractory metal for high-temperature applications — has been achieved by Drs. Seymour Senderoff and Abner Brenner of the National Bureau of Standards in a research program sponsored by the Army Ordnance Corps. The NBS experiments have produced high-purity molybdenum by electrolysis of a bath of fused salts. The process is very flexible and easily controlled; depending on the conditions of electrolysis, deposits vary from fine powders to thick, coherent layers. With further development of the process, electroforming of molybdenum objects may become feasible. More rapid, less expensive methods for producing molybdenum parts and coatings and for extracting the metal from the ore may result from this work.

In recent years the need for heat-resistant materials in various applications has stimulated interest in refractory metals such as tungsten and molybdenum. At present molybdenum is produced chemically as a fine powder by reducing purified molybdic oxide with hydrogen. However, the process is expensive and has a number of other disadvantages. The molybdenum is obtained as a very fine powder, and the size of the particles cannot be controlled. Because of the fineness of the powder, a large surface area is exposed to oxidation; extensive purification is thus required. Complicated powder-metallurgy procedures are also necessary to fabricate the powder into molybdenum objects.

These disadvantages may be eliminated by the electrolytic method, as the deposits are obtained directly on the cathode in the desired physical form and in a very pure state. Applications of the method for electrowinning, electrorefining, electroforming, and electroplating are under study. Electroforming would make possible the formation of molybdenum parts having complicated shapes. Molybdenum electroplating would have the

advantage of consuming this critical metal and at the same time allowing the designer to take advantage of the properties of the basic metal.

The NBS work on molybdenum was part of a general program of research which the Bureau is conducting in an effort to develop methods for electrodepositing in good physical form metals—such as tungsten, titanium and zirconium—which have not been deposited from aqueous solutions. In 1952 this program resulted in a practical process for electrodepositing aluminum from an organic plating bath at room temperature.[1] The molybdenum project began with an investigation of compounds representative of the stable valence states of the metal; each was studied with regard to its suitability for use in the electrolytic preparation of molybdenum from fused salts. Ultimately satisfactory results were obtained with the solutions of potassium hexachloromolybdate (III) (K_3MoCl_6) in molten mixtures of alkali halides.

Coarse powders of pure molybdenum were deposited on the cathode from a solution of K_3MoCl_6 in a 1:1 (by weight) mixture of sodium and potassium chlorides at a temperature of 900° C and current densities of 3 to 100 amp/dm^2. When a eutectic mixture of potassium and lithium chlorides was used at the same current densities and at temperatures between 600 and 900°C, the deposits varied in form. At 3 amp/dm^2 and 600°C the deposits were thick, coherent layers while at higher temperatures and current densities fine powders were produced. For both solutions the optimum concentration of the molybdenum salt was about 4 mole percent.

It was discovered that contamination by oxy compounds resulted in low current efficiency and impure deposits. All materials were therefore dehydrated carefully before use, and the electrolyses were carried out in an argon atmosphere. Apparatus was designed which permitted high-temperature operation with automatic temperature control, external manipulation of electrodes, and automatic agitation of the cathode. The design of the equipment was greatly simplified by the use of induction heating.

... Continued on page 66

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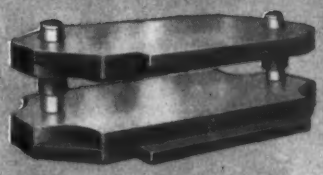

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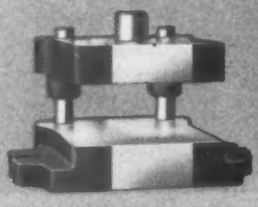

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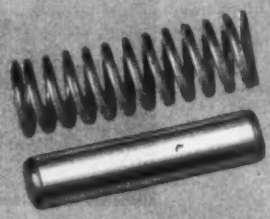

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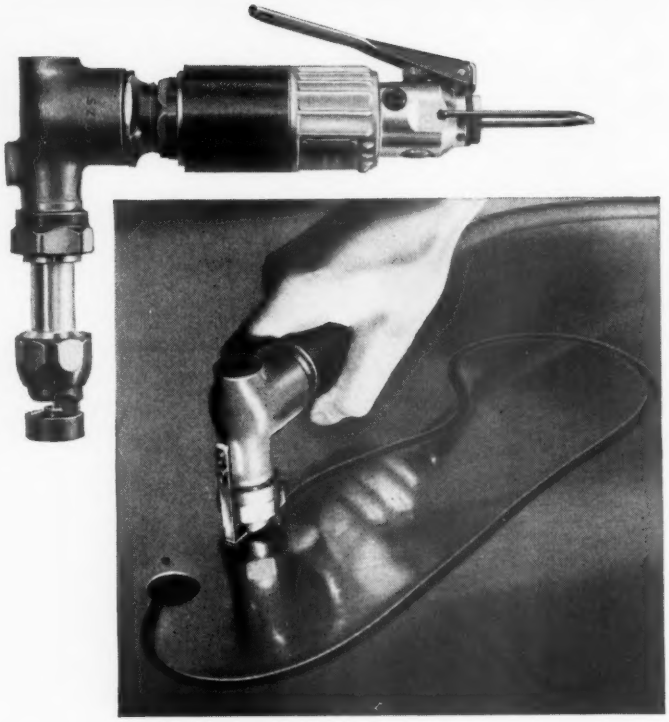

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. . . Molybdenum, from page 65

A water-cooled induction furnace coil surrounded the lower third of a Pyrex cylinder 1½ feet long and closed at the bottom. Inside the lower third of the Pyrex tube was placed a ceramic cylinder, and within the ceramic was a machined graphite crucible containing the fused salts. The top of the glass cylinder was sealed with a rubber bung containing openings for the electrodes, a thermocouple tube, a connection to the gas system, and an escape chimney.

A rod ¼ inch in diameter and 2 feet long was inserted through one of the holes to serve as the cathode. It was connected at the top to a variable-speed stirring motor by a tightly fitted rubber coupling. A soluble anode of pure commercial molybdenum sheet was used. If an insoluble anode is used a diaphragm is required to separate the anolyte from the catholyte. Both electrodes were immersed to a depth of about 3 inches. The furnace was supplied with power by a mercury spark-gap converter, which was controlled by a chromel-alumel thermocouple and a controlling pyremeter placed in the input circuit of the converter. The heating rate was rapid, the melt reaching a temperature of 900° C in about 10 minutes.

The procedure began with purification of the alkali chloride mixture. This was done by fusing it in the graphite crucible at a temperature a few hundred degrees above its melting point and allowing it to cool in an inert atmosphere. The Pyrex vessel was then opened, and the previously dried molybdenum compound was quickly added on top of the solid halide solvent. The system was evacuated and flushed out with argon. Heating was then begun, and at the desired operating temperature the electrodes were inserted into the melt. During the run the flow rate of the argon was set at any value between 200 and 3000 cm^3/min, and the outlet chimney was always adjusted to maintain a pressure slightly above atmospheric inside the system at all times. When very hygroscopic material, such as lithium chloride, was present, the bath was heated to 900°C at the same time as the argon flow was increased to about 3000 cm^3/min. This

rapidly drove out any released moisture and volatile oxy compounds. Electrolytic purification was also found to be effective.

The deposits adhered well to the cathode and were easily separated from the adhering electrolyte by leaching with dilute hydrochloric acid. Deposits from both types of solutions were found to be more than 99.9 percent molybdenum and to contain as low as 0.026 percent oxygen. The density of the coherent deposits was 9.6, or 94 percent of the theoretical density of molybdenum. The current efficiency for metal deposition was 100 percent in both solutions over the full range of current density.

In the course of the investigation improved methods for the preparation of K_3MoCl_6 and of molybdenum dichloride, $(MoCl_2)x$, were developed. In the preparation of the hexachloromolybdate, potassium molybdate was dissolved in hydrochloric acid, and the solution was electrolyzed in a divided cell. Hydrogen chloride was then added to the catholyte to precipitate K_3MoCl_6. The molybdenum dichloride was obtained by first reducing the pentachloride with molybdenum powder to the trichloride, which was then heated to produce the dichloride by thermal dissociation.

Electrode potential studies were carried out on systems of the type electrolyzed after a reference electrode half-cell suitable for use with molten salts was developed. These studies not only provide interesting information on the physical chemistry of molten electrolytes but also indicate that the NBS process might be successfully adapted to the electrorefining of molybdenum.

1 New aluminum plating process, NBS Technical News Bulletin 36, 86 (June 1952); see also A hydride bath for the electrodeposition of aluminum, by Dwight E. Couch and Abner Brenner, J. Electrochem. Soc. 99, 234 (1952).

Note: For further technical details, see The electrolytic preparation of molybdenum from fused salts, by Seymour Senderoff and Abner Brenner, J. Electrochem. Soc. 101, 16 (1954).

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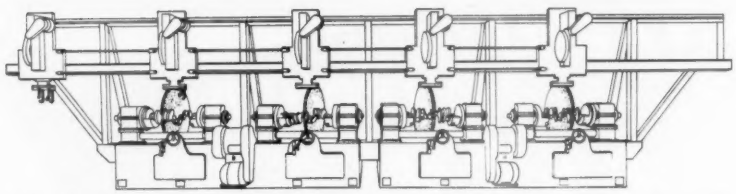
CIRCLE INFORM-A-GRAM KEY NO. 67

Grinding Crankpins Automatically



A sketch of one of the two transfer type crankpin grinders under construction. One operator supervises the complete unit which has a grinding station for each crankpin to be ground.

The highest form of automation in metal-working today probably exists in the automobile industry where castings of engine parts leave the foundry and proceed through the various machining operations without a human hand touching them. Many of these operations have been done automatically for several years. However, precision grinding has resisted efforts at automation up to now because it has not been possible to obtain the close tolerances required of mating parts without human attention.

At the present time, Norton Company is building two Transfer Type Crankpin Grinders. These machines have been designed to mechanize all the manual duties of the operator as well as incorporating the most advanced equipment for accurately grinding the crankpins automatically.

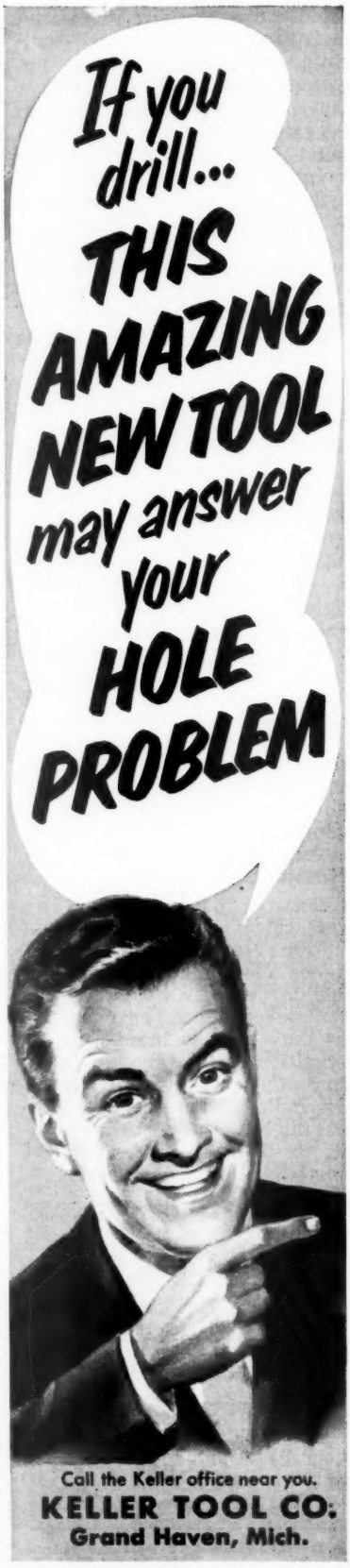
When using these machines, the operator will merely observe the operation, touching nothing, while all the grinding and handling functions are accomplished automatically and continuously. As the crankshaft proceeds from one grinding station to the next, succeeding journals are ground until the shaft is finally deposited on a conveyor line, completely ground. A single operator is required to supervise the complete unit which has a grinding station for each crankpin to be ground.

In addition to the actual motions involved in loading and unloading and grinding the crankpins, an important feature of the Transfer Grinder is automatic truing of the grinding wheels at predetermined intervals — that is after each grind or any number of grinds as may prove most economical. As the wheel is trued, there is an automatic compensation made in the wheel feed mechanism for the reduction in diameter of the grinding wheel.

An arrangement for automatically inspecting each crankpin after it is ground is available on the machines now being made. Inspection is accomplished while the crankshaft is being transferred between grinding stations. A system of lights controlled by the inspection device warns the operator when the ground size of the shaft approaches either the high or low limit of the allowable tolerance. Adjustment of wheel position to correct the error is then made by the operator.

. . . Continued on page 100

This view shows the details of the through feed arrangement which provides this HYDROLAP high production lapping machine with automatic loading and unloading.


If you drill...
THIS AMAZING NEW TOOL
may answer your HOLE PROBLEM
Call the Keller office near you.
KELLER TOOL CO.
Grand Haven, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 68

Announcing

a completely AUTOMATIC, self-contained, PORTABLE drilling unit with advantages you expect only in expensive machine tools

Peck drilling four deep holes in a magnesium casting

THE NEW SERIES 92A KELLER "AIRFEEDRILL"

—locks to any jig or fixture, and drills accurately. Stationary mounting brackets available

—operates automatically through the complete drilling cycle—advances, drills, retracts, shuts off—at a single pressure of the control valve

—handles peck drilling and skip drilling

—gives complete control over motor speed, drilling speed, torque, rate of advance, and depth of hole

It has these operating features:

SENSING TYPE RAPID ADVANCE brings the drill point quickly to the work, then drops instantly to the drilling rate.

TORQUE CONTROL causes automatic retraction as often as necessary to clear chips during peck drilling. It also protects drills and indicates when they need sharpening.

FEED CONTROL permits adjustment to varying drilling conditions, as well as the material being drilled.

VARIABLE SPEED MOTOR controlled by throttle valve . . . shuts off automatically at end of drilling cycle.

Lightweight and compact—ideal for use in portable or stationary applications

These and other features mean that you can tool up for a few hundred dollars . . . instead of thousands. Send for Catalog Section 92 which fully describes and illustrates this remarkable new tool.

KELLER "Airfeedrill"

SERIES 92A

KELLER TOOL COMPANY, 1313 Fulton St., Grand Haven, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 69

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PLASTICS MOLDS

by Gordon B. Thayer

Tells how to
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22 chapters (272 pages) of plastics tooling and production KNOW-HOW. More than 200 illustrations, tables and charts. *$3.49 per copy.*

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. . . Competition, from page 35

a very complicated picture.

Frankly, I don't think the picture is complicated at all. What has happened is that our country has finally been freed from the regulations and controls imposed through a long series of emergencies, real or political, and our economic system is now able to return to its normal basic job which is that of producing, under the free competitive system, better things for more people at lower cost.

This brings me directly to the subject of machine tools. Competition is the reason for the existence of the machine tool industry. Why is a machine tool purchased?

A machine tool is purchased for one purpose and one purpose only—to cut production cost.

The machine tool builder may think he is selling machinery but that is not what he is actually selling. What he has for sale is "lower cost per piece produced."

Under our American system, the company that over the years continues to give its customers the best values gets the business. The company that fails to do so loses the business.

In order to give the customer, the best values, a company must reduce its costs. With wage rates fixed, with tax relief problematical, with overhead items almost impossible of reduction, the main road open today whereby manufacturers can cut their costs is that of replacing old-fashioned obsolete high cost machine tools with new machines which turn out more work in less time, with quality assured by controls rather than by the skills of the individual operators.

The latest Inventory of Metalworking Production Equipment disclosed that more than one million machine tools out of less than two million in the country's metalworking industries are 10 years or older; and one out of five machines is actually more than 20 years old. Two out of three machines are of a design antedating World War II.

This degree of obsolescence is literally shocking. Today, we are back to normal, and normal in this country means "keenly competitive." Competition imperatively demands cost reduc-

tion. To place itself on a competitive basis today, a company must have a planned program of modernization which will mean greater productivity per man employed.

Does the machine tool industry have ready, for delivery today, new models which will accomplish the cost reduction demanded by today's competitive situation?

My answer is definitely "yes." The nation's swing back from an emergency picture to a competitive picture has provided a stimulus such as the industry has not seen in many years.

Certain trends in new machine design are already well established, and I think these will be accentuated in the future:

Advances in automatic operation

Faster tool-cutting motions

Advances in electronic controls

More rugged construction to match the capacity of better cutting tools

Better work-holding devices

Faster loading and unloading, to match faster cutting or forming time

Most of you will understand the implications of these trends from the standpoint of cutting production costs.

But I want to talk to you briefly about the implications of these trends from the standpoint of the general welfare of society and the preservation of the American free competitive system.

We have developed a dynamic economy in the United States which assumes progress as the normal state of affairs. Everybody in this country has the idea that this year he can get more and better things than he got last year. This is one of the basic elements of faith in the American system. If we want to preserve this system, we must preserve this faith; and we can only do it by performance.

It is up to American industry to prove that more people can get more of the things they want under our free competitive system than they can under the communistic system, under the socialistic system, or under any other system yet to be devised.

American industry must, each year, year after year, be able to

. . . *Continued on page 78*

Gorton Pantograph Does Job 7 Times Faster

In only 40 minutes this tracer-controlled pantograph cuts and blends a thermal slot in an 8-foot steel propeller blade — a job that requires 5 hours 10 minutes by other methods. This is typical Pantograph performance — one of hundreds of examples.

Gorton Pantography Brings *Creative* Production to Your Plant

What's *your* problem in machining? Depend on Gorton Pantography to help you *create* a new production method if your problem falls into any of these categories:

OPERATIONS

Inside profiling
Outside profiling
Routing
Die sinking
Mold cutting
Counterboring
Chamfering
Grooving
Graduating
Engraving

MATERIALS

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Non-ferrous metals
Plastics

SHAPES

Flat
Uniformly curved
Cylindrical
Square
Spherical
Irregular

Gorton Pantography works in two or three dimensions, in all directions on a horizontal plane, and vertically. It uses enlarged masters, templates or patterns — easily and inexpensively made. Normal operation takes advantage of the reduction ratio principle for increased accuracy in the work piece — an exclusive pantograph benefit.

Whether a dozen or a thousand pieces, each is identical in shape and tolerances to the first. Operation during cutting cycle is manual or automatic, and work piece size varies from the diameter of a dime to areas as large as ten feet.

Clip the coupon for your copies of the Gorton catalog and the helpful booklet, "Pantography."

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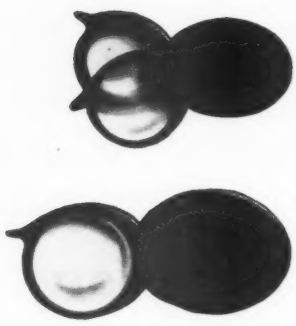
CIRCLE INFORM-A-GRAM KEY NO. 71

Folding magnifiers ideal for toolbox, bench or pocket



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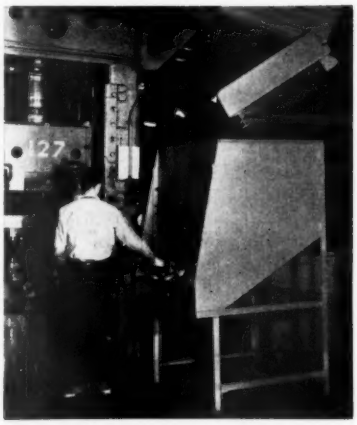
Industrial Magnifiers

CIRCLE INFORM-A-GRAM KEY NO. 72

WORK-O-MATIC GRAVITY HOPPERS

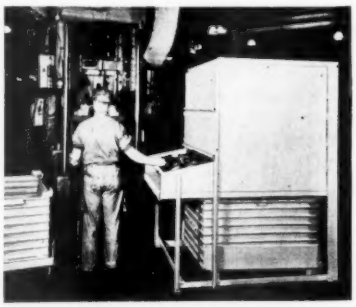
Vertical mass material supply at the use point is now easily accomplished with two new Work-O-Matic Gravity-Fed Hoppers,



Compact Work-O-Matic Hopper takes no more space than industrial container, holds 12,000 pounds in volume of 34.8 cubic feet. Safely loaded from sides, corners or back by Union Metal Drop-Bottom Box.

made by The Union Metal Manufacturing Co. of Canton, Ohio.

Both portable hoppers are designed to minimize or eliminate in-process storage and its costly rehandling through material flow coordination. These hoppers release industrial containers for other uses. They also



Vertical mass material supply of 21,000 pounds in a combined volume of 67.4 cubic feet is provided at this punch press by Union Metal Gravity-Fed Hopper and Work-O-Matic box stored underneath.

free fork trucks for other duties because they can be loaded between shifts or whenever convenient.

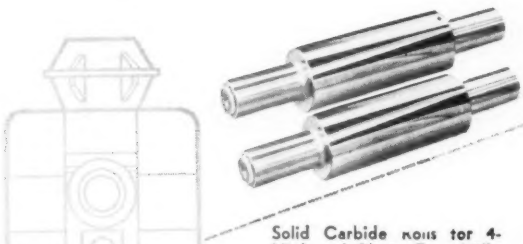
Literature available upon request.

Inform-A-Gram Key No. D2.

Talide ROLLS double production of your mill

Send for New 84-Page Catalog 54-G or Ask for Sales Engineer to Call.

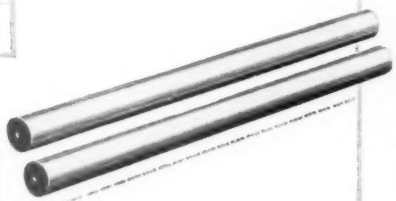
Metal Carbides Corp., Youngstown 7, Ohio



Solid Carbide Rolls for 4-High and Cluster-Type Mills.

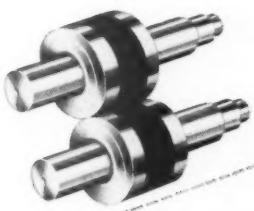
1600 to 20 coils

LARGE PITTSBURGH STRIP STEEL PRODUCER reports rolling 1600 coils of low carbon, high carbon, stainless and alloy steel strip with Talide rolls before same needed regrinding. Best previous service life obtained with steel rolls averaged between 16 and 20 coils.



168 to 7 hours

LEADING OHIO STRIP STEEL PRODUCER averages 750 coils of various types and analysis between grinds, enabling them to operate their cold rolling mill continuously without roll changes for 7 days, 3 turns per day. Previous steel rolls used averaged 6-8 hours, necessitating 3 or 4 roll changes per day with considerable down-time.



Sleeved Rolls for Flat Wire Mills.

50 to 2 coils

LARGE STEEL PRODUCER of straight chrome and nickel-chrome stainless steel strip now operates continuously for 3 turns or more with Talide rolls, whereas with steel rolls it was necessary to change 7 or 8 pair per turn. 50 coils are now rolled per regrind compared to 2 coils with steel rolls.

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TALIDE

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HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 73

JIG GRINDING ACCURACY *guaranteed**

INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 6 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3⅛" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.

*Dependably accurate to "tenths"

Vulcanaire

It's built by toolmakers for toolmakers

MAJOR VULCAN SERVICES

Engineering, Processing, Designing and Building, Special Tools . . . Dies . . . Special Machines . . . including the *Vulcan Hydraulics that Form, Pierce, Assemble and Size.*

VULCAN TOOL CO.

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CIRCLE INFORM-A-GRAM KEY NO. 74A

YESTERDAY'S PIONEER . . . TODAY'S LEADER

Patent Applied For

WELDON

COUNTERSINKS *and* DEBURRING TOOLS

With Single Cutting Edge

Revolutionary! Chatterless!

• Greater ease in cutting is the outstanding feature of these new cutting tools—made for 82° angle countersinking and for 90° angle deburring operations. Have only a single cutting edge which prevents chatter. Both tools are regularly made for right hand cut. One trial will convince you. Special tools of this type made to order.

Write for further details.

WELDON Distributors throughout U. S. A. and Canada carry complete stocks to serve you

THE WELDON TOOL COMPANY

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CIRCLE INFORM-A-GRAM KEY NO. 74B

— QUICK-PIC CATALOGS —

News and Views of Current Literature

AIR OPERATED CLUTCHES

For machines where a fast cycle and accurate stopping are essential, an improved series of "LK" (low kinetic energy) type clutches has been brought out by the Industrial Clutch Corp., Waukesha, Wis. Eighteen sizes are listed in Booklet 5005 covering maximum working torques from 3300 to 430,000 pounds feet.

Circle Inform-A-Gram No. E1

DIE CUSHIONS

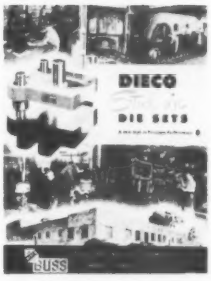
Quick facts on Dayton Rogers' die cushions are contained in this illustrated circular. Also included are specifications, diagrams and data on the accurate adjustable working pressure on all dies in place of springs or rubbers. The folder can be had by writing to the Dayton Rogers Co., 2824 13th Ave., Minneapolis, Minn., or—

Circle Inform-A-Gram No. E2

PRECISION DIE SETS

Steps involved in the manufacture of precision die sets are illustrated and described in condensed form in a leaflet just issued. Included is data on manufacturing 1728 combinations of die sets. Copies are available from The Die Supply Co., 1400 Brookpark Rd., Cleveland 9, Ohio. Ask for Bulletin 71, or—

Circle Inform-A-Gram No. E3



DRILL JIGS & FIXTURES

This catalog contains data essential to designers and engineers and the contents are also of interest to others in the metalworking field. It contains application and technical data as well as diagrams. Write to Swartz Tool Products, 13330 Foley Ave., Detroit 27, Mich., for Bulletin No. 953, or—

Circle Inform-A-Gram No. E4.

SPADE & CORE DRILLS

Conner-Type spade drills drill from the solid and keep on drilling without being retracted to clear them of chips. Recommendations are given in this catalog as to proper selection of tool. Outstanding features of core and spade drills included. Write to Gairing Tool Co., 21221 Hoover Rd., Detroit 32, Mich., or—

Circle Inform-A-Gram No. E5

DIAMOND WHEELS

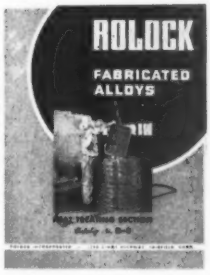
A technical outline on the correct applications of diamond wheels is presented in Catalog No. 1054 now being distributed by the A.I.T. Diamond Tool Co., 646 W. Lake St., Chicago, Ill. Also included is some information on the types of wheels manufactured by A.I.T. in the new A1-Aloid bond for plunge grinding.

Circle Inform-A-Gram No. E6

FABRICATED ALLOYS

The proper handling of parts in metalworking plants is a vital factor in speeding operations, stepping up quality and reducing costs. This catalog presents photos and data on 74 baskets, trays, racks, fixtures, muffles, etc., that are made for this purpose by Rolock, Inc., 1350 Kings Highway, Fairfield, Conn.

Circle Inform-A-Gram No. E7



HYDRO-MECHANICAL DEVICES

Presented in this bulletin are two series of hydraulic cylinders of different ratings which use a single screw thread to retain the cylinder heads to the cylinder body. Illustrations, specifications and drawings are included. Write to the Pathon Mfg. Co., Cincinnati 12, Ohio for Bulletin No. 22, or —

Circle Inform-A-Gram No. E8

CHROMIUM CARBIDES

What are Chromium Carbides? The answer to this question is contained in a bulletin now available from Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa. Properties, applications and other pertinent details are included in the booklet. Write direct to the company for your copy, or —

Circle Inform-A-Gram No. E9

BENDING ROLL

For production bending of angles, flats, pipes, tubes and special shapes, the Buffalo Forge Co., Buffalo, N. Y., has its No. "OA" bending roll. And for TOOLING and PRODUCTION readers, the firm has available an illustrated catalog which gives specifications and dimensions as well as other pertinent facts on this machine.

Circle Inform-A-Gram No. E10

Plastic DRAWER JIFFY CABINETS

THE BEST WAY TO PUT SMALL ITEMS IN THEIR PLACE!

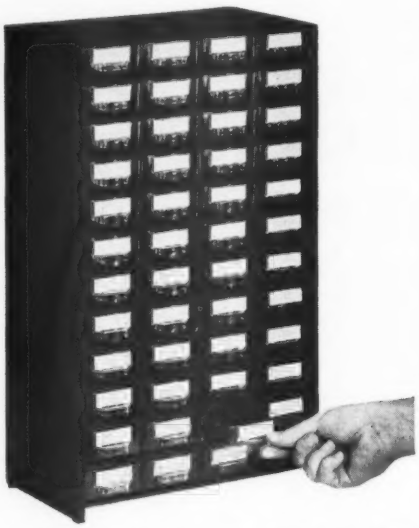
In every home, in every office, in every shop, there are dozens of small parts requiring easy, convenient storage. The slickest, handiest answer to this problem is the JIFFY Cabinet.

CHECK THESE FEATURES:

• 3 New Color Combinations
Cocoa Brown with tan drawers.
Black with gray drawers.
Red with crystal-clear drawers.

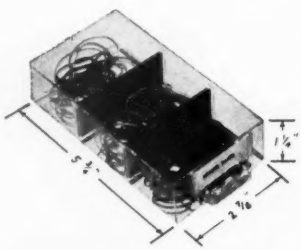
• Solid One-piece Back Panels
Keep dust out . . . maximum strength girder type construction . . . ready-made keyhole slots for handy wall mounting.

• Rubber-tipped Cabinet Feet
Prevent scratching . . . increase stability . . . make stacking convenient.



Illustrated — 48-drawer JIFFY Cabinet, red frame with crystal-clear styrene drawers.....only $19.95*

• Generously Sized Drawers
More than 18 cubic inches in each one . . . full set of index labels and drawer dividers supplied with every cabinet.



Inside of drawer easily divided into three compartments with metal dividers as illustrated. Each drawer has a stop to prevent accidental spillage and to permit drawer to hang open from back edge. Ribbed runners on bottom of all drawers permit them to slide freely. Index slots on front of drawers allow easy identification of contents.

HANDY PRODUCTS, P. O. BOX 2447, CLEVELAND 12, OHIO

Please send immediately the quantity, size and color JIFFY units as listed:

☐ 48 Drw. @ $19.95* ☐ 32 Drw. @ $12.95* ☐ 24 Drw. @ $9.95* ☐ 16 Drw. @ $7.95*

☐ **Red w/clear drwrs.** ☐ **Black w/gray drwrs.** ☐ **Brown w/tan drwrs.**
(NOTE: If color is not specified, we will ship Red Cabinet w/clear drwrs.)

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Will You Be There?

May 4-7. American Welding Society. Exposition and Spring Technical Meeting. Buffalo, N. Y.

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May 8-14. American Foundrymen's Society. Annual Convention. Cleveland.

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May 12. New York State Department of Commerce. Industry Conference on Automatic and Industrial Development. Syracuse, N. Y.

•

May 16-20. Basic Materials Exposition and Conference. Clapp & Poliak. Chicago.

•

May 23-26. National Office Management Association. International Conference. St. Louis.

•

May 24-27. Symposium on Instrumentation, Institute of Industrial Health, University of Michigan. Ann Arbor, Mich.

•

June 6-9. American Gear Mfg. Ass'n. 38th Annual Meeting. The Homestead, Hot Springs, Va.

•

June 7-10. Society of the Plastics Industry. National Plastics Exposition and Technical Conference. Public Auditorium, Cleveland.

•

June 9-11. American Society for Quality Control. 8th Annual Convention. Kiel Auditorium, St. Louis.

•

June 15-25. Conference on Machine Tool Technology. Massachusetts of Technology. Cambridge, Mass.

•

June 16-18. High Vacuum Symposium, Committee on Vacuum Techniques. Berkeley Cartaret Hotel, Asbury Park, N. J.

•

July 12. National Machine Tool Builders' Ass'n. Machine Tool Sales Conference. Cornell University, Ithaca, N. Y.

•

July 13-15. Western Plant Maintenance Show. Pan Pacific Auditorium, Los Angeles.

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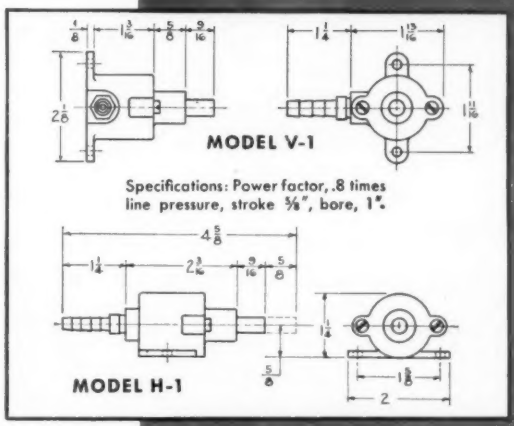

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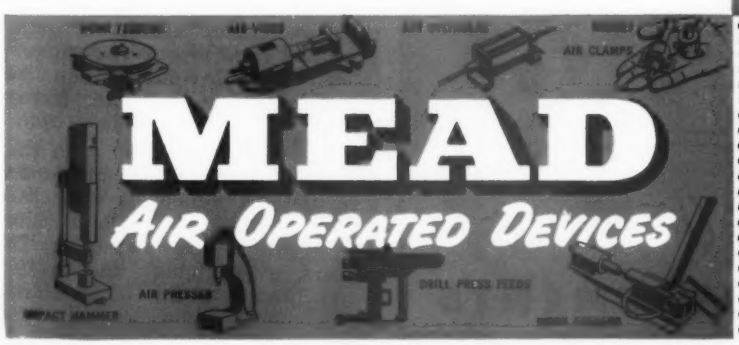

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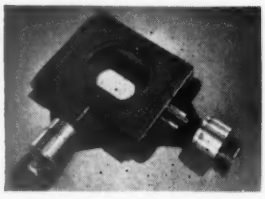

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Quality Control INSTRUMENTS

CIRCLE INFORM-A-GRAM KEY NO. 78

. . . Competition, from page 71

provide the average American citizen with more of the things he wants in return for his day's work. And this brings us right back to cost reduction, increased productivity, new and improved machine tools.

There has been a great deal in the newspapers recently on the subject of employment. Various groups are trying to make capital out of unemployment for political purposes, and in this connection we may see raised, in the near future, the old cry that machines put men out of work.

Of course the facts are exactly in reverse. Machines do not destroy jobs. Better machines create jobs. This story is a very simple one—

Machine tools enable a manufacturer to reduce the cost of his product.

As the cost goes down, more people can buy his product.

As his production goes up, he can employ more people.

As more people are employed, more people can buy the products of American industry.

Larger production volume in turn makes possible further mechanization which, under the operation of our free competitive system, reduces costs still further.

This is a sequence which America has discovered — the sequence which has put its standard of living, and its range of opportunity for the individual.

I present these thoughts to you, because I think it is vital today that you think not only in terms of technological possibilities but in terms of social relationships. The nature of the world of tomorrow is being forged along social rather than technological lines. The best inventions in the world will be no protection against a regimented form of government unless those inventions can be translated into a higher living standard for the people.

You are all familiar with the Internal Revenue Department's regulations which have in the past enforced a machine tool write-off period averaging 20 years, even though the useful and profitable life of machine tool models averages only 10 years, and the industry obsoletes

its models at the average rate of about every seven years.

The result of this has been that companies buying new machine tools have been able to recover, from depreciation allowances on the machines to be replaced, only a fraction of the cost of the new machines; and the balance has had to be paid for out of earnings **after** taxes. This has been a serious deterrent to the replacement of old machines by new.

The House Ways and Means Committee is recommending, as part of the next tax law, substantial relaxations with regard to depreciation provisions. We do not as yet know just what form this will take, but we think it will be based upon the declining balance system of depreciation now in effect in Canada and various other countries.

Under this system a company could elect to write off a new machine tool within 10 years, on the basis of 20% of the cost the first year and declining percentages thereafter. A company would be permitted, if it so wished, to write off approximately 67½% of the cost of a new machine within the first five years after its purchase.

It is far too early to predict at this point whether or not such provisions will actually be enacted into the new tax law; but, if they should be enacted, such provisions would revolutionize the attitudes and the policies of all American industries with respect to modernization programs.

Such a revision of the tax law would put equipment replacement upon a basis of recovery of the cost of a machine within the probable period of its useful and profitable life. If depreciation allowances are provided for upon a realistic basis, the result will be an accelerated modernization program such as this country has not seen for many a year.

Three great systems are now competing for world support—Communism, State Socialism, and the American Free Competitive System. It is up to us to show that our system can do the most, for the largest number of people, over the long run. It is my contention that doing the most for the largest number of people is, in the last analysis, a proposition of increased productivity and reduction in cost per piece produced. That is the function of machine tools.

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Made in 23 sizes, 1½" x 2" to 6" x 6" in 2 to 3 heights each.
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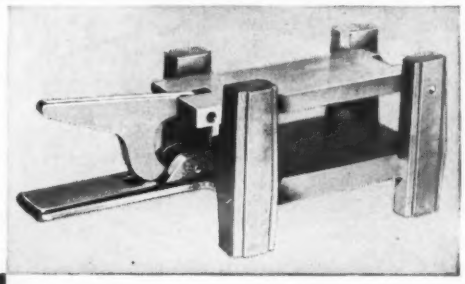

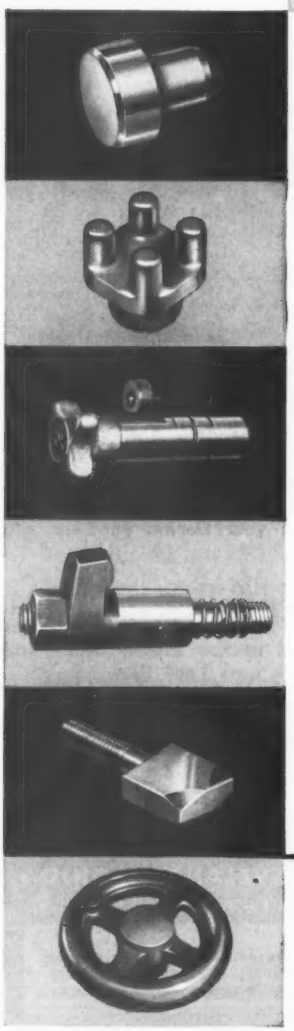

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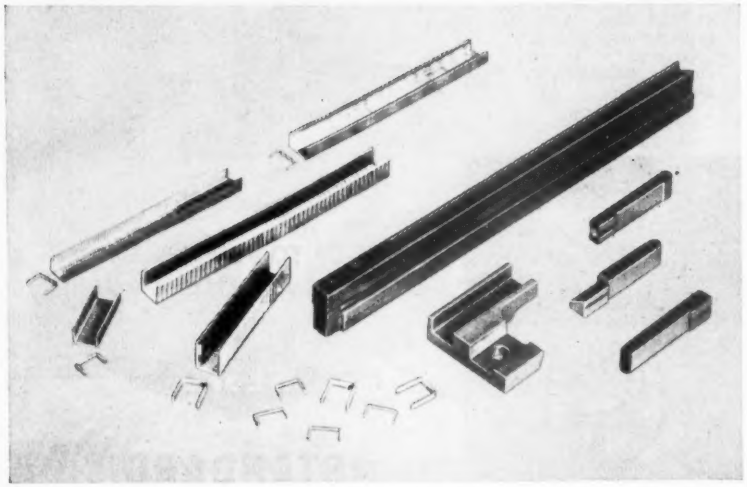

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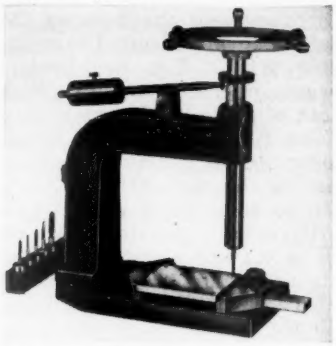
SUPERSENSITIVE HAND TAPPER

This machine was developed to meet the demand for a highly sensitive tapping machine, with finger tip control which is so



necessary for many tapping requirements. It is especially recommended for taps from #0 to 5/16". Tap adapters are available to ⅝". An illustrated catalog describing this hand tapper is available from the Lassy Tool Co., Plainville, Conn.
Inform-A-Gram Key No. D3.

NEW YORK STATE HOLDS AUTOMATION CONFERENCE

The pushbutton dream factory of the future will be envisioned on May 12 when the fundamental technological aspects of automation in industry of New York will be discussed by leading state industrialists and engineers assembled for a one day management conference at Syracuse.

Sponsored by the New York State Department of Commerce, the gathering, first of its kind called by a State agency, will hear a panel of experts present various phases of automation under the title of "Automation and Industrial Development."

The application of this new industrial science to present-day processes will be explained by Kenneth R. Geiser of the General Electric Company; Dr. H. W. Martin of Rensselaer Polytechnic Institute; L. A. Harr of Remington Rand, Inc.; H. A. Franke, automation superintendent of Ford Motor Company, Buffalo; and other speakers.

Registration for the conference may be made by writing to the New York Dept. of Commerce, 112 State Street, Albany, N. Y.

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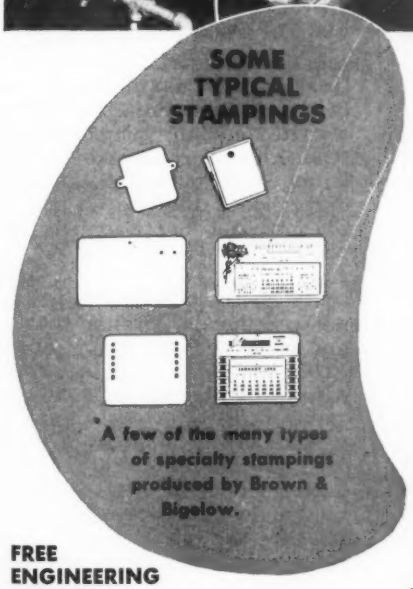

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CIRCLE INFORM-A-GRAM KEY NO. 81

Matched-Die Molding of Reinforced Thermoplastics*

by E. Y. Wolford
Chemical Division
KOPPERS COMPANY, INC.
Pittsburgh, Pennsylvania

THE PROCESS for forming thermoplastic articles by injection molding under pressure is characterized by rapid production of large quantities of molded pieces.

As the matched die may have one or more cavities, a multiple of the same object may be produced at one time or several different objects may be produced at the same time. All the parts of an assembly can be simultaneously produced so that, when later assembled, there is a sufficient quantity of each part at hand.

While the rapidity of production minimizes the operating labor cost, the investment in machine and matched mold equipment is relatively large compared to the economic upgraded value of a single piece of the production, as is also the cost of the time for setting up the mold in the machine and the cost of the time for bringing the production on stream.

In view of the equipment investment and cost of setting-up time, the process is most economical for objects which are required in volumes in the hundreds of thousands, the process becoming more economical as the required number of duplicate pieces or assemblies rise. For short runs of duplicate pieces, the process is relatively expensive. Likewise the time required to get production on stream dictates that, once production is started, it be continued without interruption for a relatively long period of time in order to dilute the start-up cost as much as possible. Daily start-ups are relatively expensive and start-ups as frequent as several times per day are in almost every case intolerably expensive.

Material Available

About the only reinforced plastic suitable for use in this process is a glass fiber reinforced polystyrene molding compound intended for injection molding of strong rigid pieces of excellent dimensional stability. It is supplied as rod-shaped pellets approximately ½" long by ⅛" diameter.

The glass fibers in the pellets are continuous parallel strands and each pellet contains about 12,000 glass fibers, obtained from a form of fiber glass known as "roving".

Prior to the adoption of "roving" as the preferred form of glass fiber for the reinforcement used in this process, random glass fiber matte was diced into thin squares. Unfortunately, this form of glass fiber gave a premix which was so fluffy and light that

*Condensation of paper presented at the Ninth Annual Technical Conference of the Reinforced Plastics Division, Society of the Plastics Industry, and reprinted here through courtesy of the SPI.

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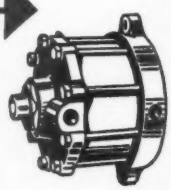
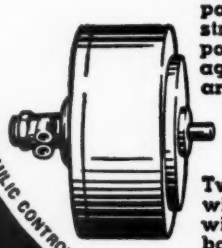
Logan
ROTATING AND NONROTATING AIR CYLINDERS

NONROTATING—7 STANDARD MOUNTING TYPES



Standard sizes from 1½" to 16" bore; maximum stroke, 18'. Special models to meet your requirements. Logan features larger ports, sturdier construction, maximum power without leakage, permanent seal around piston rod.



ROTATING

Two standard styles—Type R with cast iron body; Type K with lightweight aluminum body. Bore 1½" to 20" stroke 1" to 2". Longer strokes special.

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CIRCLE INFORM-A-GRAM KEY NO. 82

it would not flow through the hoppers and feeding devices of conventional pressure injection molding machines, and it was impossible to obtain more than about a 2 oz. shot in an 8 oz. machine. The problem has now been solved with glass fiber "roving" which considerably reduces the bulk of the mix and permits its use in the conventional injection process without difficulty and without modification of hoppers and feeding devices; and, it is now found possible to cycle a 4 to 6 oz. shot without difficulty in an 8 oz. machine.

The (heat-resistant type) polystyrene gives the premix the necessary thermo-plastic properties, particularly flow, so that in the finished molded article the polystyrene serves as a binder for the glass fibers while the glass fibers serve as a reinforcing agent for the polystyrene. In the pressure injection molding process, the polystyrene acts as a lubricant or flow medium to allow the glass fiber reinforcement to be introduced along with it into the mold cavity.

The process may now be used to make objects having good tensile and flexural strengths, rigid with little tendency to elongate, with improved resistance to shattering by impact at both ordinary and sub-zero temperatures, and not distorted at relatively high temperature as compared with standard polystyrene.

Very low shrinkage permits mold design with minimum tolerances. Availability in a wide range of translucent and opaque color is an additional advantage.

To broaden the range of the pressure injection molding process, Koppers polystyrene is furnished in two grades, Fibertuf 1 and Fibertuf X, both containing approx. 65% improved heat resistant polystyrene, the balance being essential glass fibers and pigments. Fibertuf 1 has been externally lubricated while Fibertuf X has no lubricant. This external lubricant in Fibertuf 1 improves flow out of the feed-hopper, heat transfer in the cylinder, mold release, and reduces the dusting of the pellets. The obvious advantages of external lubrication suggest the use of Fibertuf 1 in most applications. However, where an external lubricant is objectionable, Fibertuf X may be preferred.

Glass Fiber Content

The concentration of glass fiber of about 35% by weight has the maximum physical strength under practical molding conditions; premixes containing more than 40% glass fiber by weight are difficult to use in injection molding equipment due to difficult fill of cavities. Increasing the polystyrene content greatly increases the ease of molding. The reduction in glass fiber reinforcing content only slightly decreases the tensile strength, impact strength, and rigidity of the molded pieces, and the reduction in heat distortion point is surprisingly slight.

To make premix of lower glass fiber content suitable for this process, it is necessary only to drum-tumble Fibertuf pellets with Koppers Type 81 improved heat distortion polystyrene pellets or DC-82 dry coloring grade. It is essential however, that improved heat distortion polystyrene be used to obtain uniform flow of

. . . *Continued on page 87*

with a NORBIDE® Dressing Stick

JUST a couple of passes with a handy NORBIDE Dressing Stick is all it takes to clean up a wheel face, dress a radius or groove or touch up a cup or saucer wheel. And with this conveniently sized stick you can see more of the wheel and thus avoid costly over-dressing.

A NORBIDE Stick of boron carbide—the hardest material made by man—will outlast hundreds of ordinary abrasive sticks. You'll find it will greatly reduce dressing dust nuisance also.

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NORTON® BORON CARBIDE

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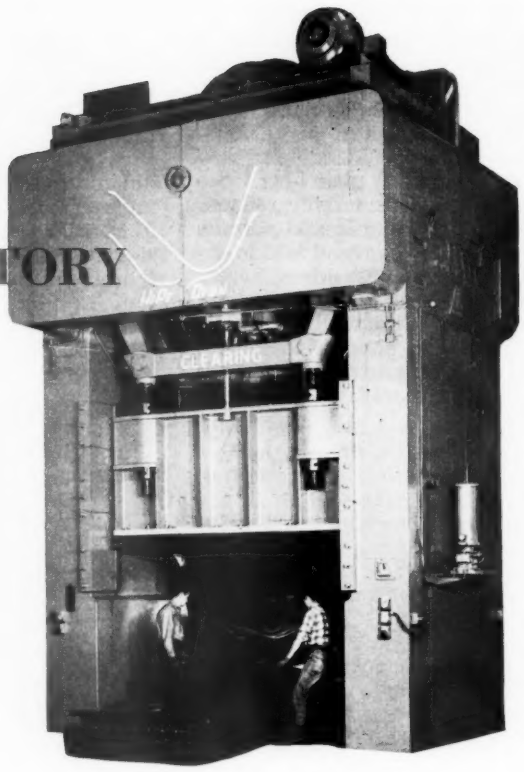
CIRCLE INFORM-A-GRAM KEY NO. 83

THE CHRYSLER PLASTIC DIE STORY



PLASTIC EXPERTS of the Chrysler Corp. have made press dies from liquid plastic that will withstand pressures over 20,000 psi in stamping out steel parts.

Although not yet used for long production runs, initial tests have proven the value of plastic dies and their use in the very near future is assured. The dies are being used in a 600-ton press at Chrysler's DeSoto Press Plant in Detroit to press sheet steel into parts for Dodge truck bodies.

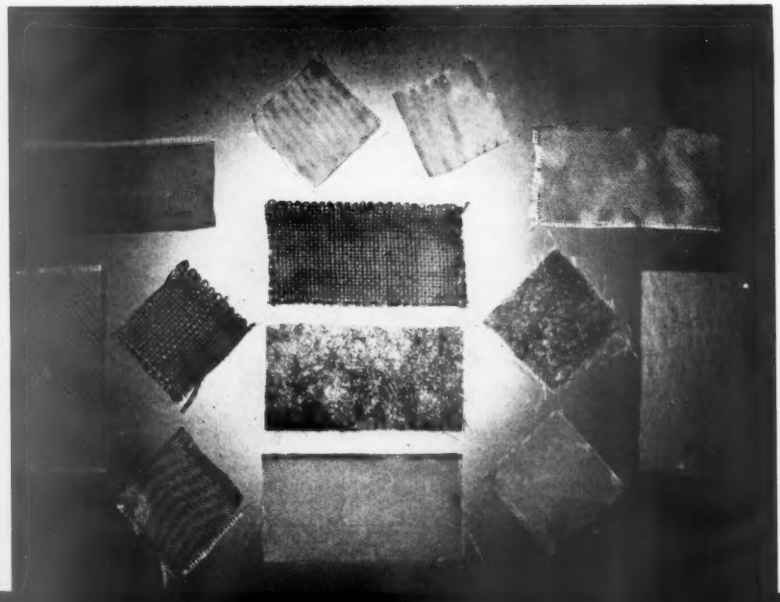
The primary advantage of plastic dies is in the speed with which they can be produced and the resulting economy.

"While conventional steel dies require 3 to 8 months to manufacture", reports C. F. Vanderkerck, Chrysler's Staff Master Mechanic, "the new plastic dies can be made in three or four weeks. Even the experimental dies now being made are 30% cheaper than conventional ones; and, when they are used on a large scale, the saving in the cost of the dies may be as high as 70%."

To make a plastic die, a liquid plastic is brought out of a cold storage room, mixed with a catalyst and poured into a plaster mold that has been prepared with strips of glass cloth and a special plastic paste. A steel plate is attached to the back of the die so that it may be fitted into the press. After setting at room temperature for 24 hours to get rid of any air

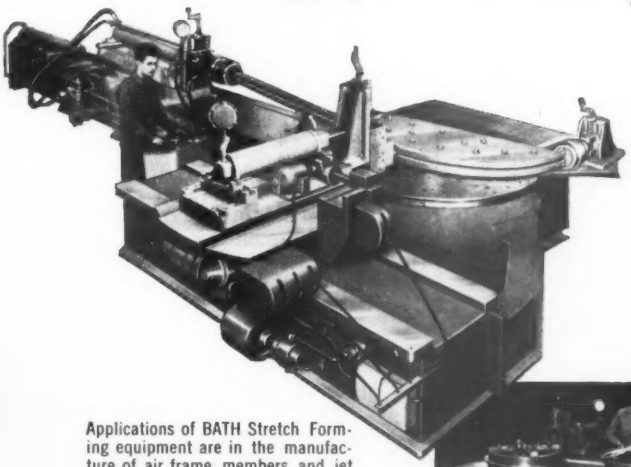
. . . *Continued on page 158*

Cloth of woven glass in various weaves and textures adds strength to the plastic dies. The fiber glass is placed just beneath the striking surface of the dies.

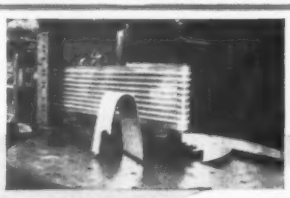


Like a huge cake, a plastic die is removed from the oven where it has been baked. As soon as the plaster cast is removed from the die, it will be ready for use.

NEXT . . . THE THERMAL BARRIER



Applications of BATH Stretch Forming equipment are in the manufacture of air frame members and jet rings for the aircraft industry. VERSATILITY, PRECISION . . . AND SAVINGS . . . are offered only in the BATH process of forming.



Aeronautical scientists are up against the terrific heat problem in cracking the THERMAL BARRIER. Heat generated by friction at supersonic speeds not only weakens metal, but surrounds the pilot in a "St. Elmo's Fire". CYRIL BATH Stretch Forming Methods are playing an important roll in accurately forming the new alloy metals to meet tomorrow's problems today.

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CIRCLE INFORM-A-GRAM KEY NO. 85

NEW SERIES ENGINE AND TOOLMAKER'S LATHES DEVELOPED

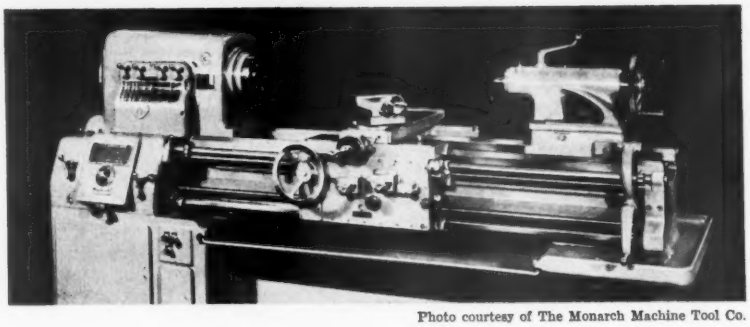


Photo courtesy of The Monarch Machine Tool Co.

Providing powered rapid traverse and other important design refinements for precision performance under continuous, heavy-duty service conditions, a new series of Monarch engine and toolmaker's lathes has been developed. The illustration to the right shows the 20″ Series 61 toolmaker's lathe.

The new Series 61 lathes—available in 13″, 16″ and 20″ sizes—incorporate for the first time, in a full range of swings, built-in apron-controlled power rapid traverse to the carriage and cross slide.

Substantial time saving, and greater operator convenience and ease are now realized, because of this exclusive design feature which provides rapid tool positioning, quick tool retraction, and fast carriage return. As a result, tool setting on most work is reduced by about 50%.

Longitudinal movement, right or left, is 160″ per minute; and cross-movement, in or out, is 75″ per minute. A safety clutch is provided for all traverse movements, which disengage automatically in case of jam. Another feature is a direct-length reading dial which, built into the apron, facilitates multiple diameter turning and blind hole boring.

Other noteworthy design and construction features include totally-enclosed gear box and end gearing, automatic pressure lubrication, anti-friction bearings, helical-geared headstock utilizing ground or shaved gears, American standard Camlock spindle nose, flame-hardened and precision-ground integral bedways, and all critical parts made of hardened alloy steel.

CIRCLE INFORM-A-GRAM KEY NO. 86

Multipress Films

Three sound films, covering the operation of the Denison Multipress, are now available from the Denison Engineering Co., 1160 Dublin Rd., Columbus, Ohio.

The films are: "Multipress—and How You Can Use It!", a discussion of operating characteristics; "Blanking and Forming", showing on the job production scenes; and "Index to Profits", which describes features of the Denison hydraulic index table.

. . . Thermoplastics, from page 83

the mixture into the mold. Reduction in glass fiber content to below 10% is not recommended due to poor distribution of the fibers in the molded object regardless of any special precautions.

Molding Technique

As with any other thermoplastic, the optimum conditions of the process will depend on the relationship of piece weight and area to machine capacity as well as upon the details of product geometry and mold design. The optimum operating temperatures for the plasticizing cylinder are selected in a roughly inverse relationship to overall cycle and should be between 450° and 600° F, corresponding with cycles of 120 to 30 seconds. Exposure to higher temperatures for long periods should be avoided in order to prevent discoloration due to scorching. As a means of avoiding scorching, the importance of keeping the process in cycle without interruption is as weighty with this type of material as with other thermoplastics. However, it has been found that minimum restriction to rapid flow between heating cylinder and mold cavity does not cause scorching.

Addition of the glass fiber reinforcement to polystyrene causes rapid set-up in the mold. This is noticeable even at minimum glass content and permits very short cycles. For this reason, it is advisable to heat the nozzle and provide an adequate sprue-puller ("cold slug") well. In addition, runner extensions should be provided to trap material chilled while on its course to the cavities. For the same reason, it is essential to warm the mold surfaces to 150° to 180° F, preferably by circulation of hot water or oil through channels in the mold.

The hotter the mold, the better will be the surface finish. However, high lustre typical of polystyrene should not be expected as glass fibers near or just below the surface of the piece tend to give a matte or satin finish or appearance to the piece. The greater the dilution of glass reinforcement by Type 81 pellets, the glossier the surface will be and the less will be this matte appearance.

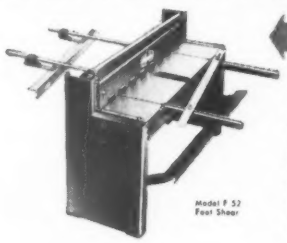
In the practice of the injection molding process, many molds that run efficiently with either standard polystyrene or other thermoplastics have been operated successfully with Fibertuf 1 with only minor adjustments of cylinder temperature, pressure, booster or plunger time. These molds have had modern design features: sprue diameter proportional to shot; full round runners; and conventional gating. Restrictions in the flow path, and particularly in gating have had to be removed or enlarged in some cases to enable the transmission of higher effective pressure to the material in the cavaties. Very small restricted or pinpoint gates particularly when poorly balanced, and tapered approaches, have shown a tendency to clog temporarily during fill. This leads to poor distribution and break-up of the reinforcing glass fibers, and product properties to below the potentials obtainable when using ample gates

. . . Continued on page 101

Announcing a NEW SHEAR LINE by...

famco

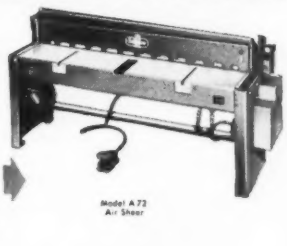
●18 FOOT, AIR AND POWER-DRIVEN MODELS CUT 14-20 GAUGE



Model F 52 Foot Shear

Foot Shears in 6 models

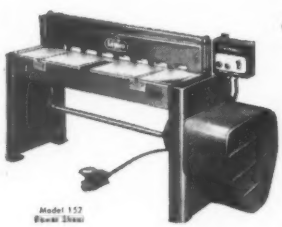
Capacity: 16 gauge mild steel in 36", 42" and 52" widths, and 18 gauge in 22", 30" and 72" widths. All-steel box-type construction.



Model A 72 Air Shear

Air Shears in 4 models

Capacity: 16 gauge mild steel in 36", 42", 52" and 72" widths. Feature low initial cost, ease of operation.

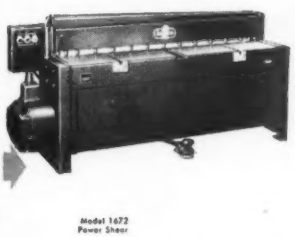


Model 152 Power Shear

Power Shears in 8 models

Capacity: 18 and 20 gauge mild steel in 36", 42", 52" and 72" widths. Feature "Electromatic Clutch" with faster operating speeds.

Capacity: 14 and 16 gauge mild steel in 36", 42", 52" and 72" widths. Feature "Electromatic Clutch" and rugged gear transmission, roller bearing equipped.



Model 1672 Power Shear

The new Famco complete Shear Line brings to American Industry new, modern concepts in Foot, Air, and Power Shear features, efficiency and design at new savings in time and money. Famco has anticipated future shear developments such as all-steel construction possessing new rigidity and inert structural strength; four-edged alloy blades; and exclusive Famco "Electromatic" clutch . . . the electrically operated 9-point jaw clutch . In addition, Famco controls produce a new high in safety factor levels, never before possible with this type of equipment. For further details, see your dealer or write for free catalog.

f famco machine company

3124 SHERIDAN ROAD • KENOSHA, WISCONSIN

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CIRCLE INFORM-A-GRAM KEY NO. 87

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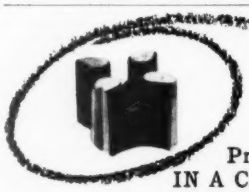
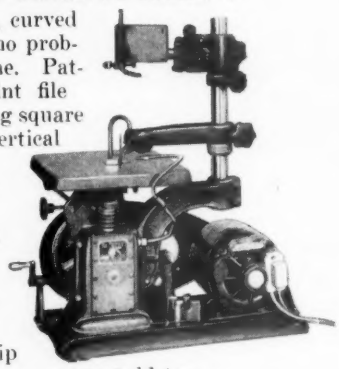
CIRCLE INFORM-A-GRAM KEY NO. 88A



THIS
FILE SETTING SQUARE
Puts the ALL AMERICAN Precision Filing Machine IN A CLASS BY ITSELF!



Crooked, bent, curved file shanks present no problem for this machine. Patented universal joint file clamp and file setting square assure true and vertical position of file or other tool in a matter of seconds. Hones and saws too. Neoprene bellows keeps dirt and chips out of oil-filled housing and supplies air to chip blower. Two overarms—one to hold top of hones and saws—the other to back up file or hone or to guide saw. Highly accurate. Time-saving. Send for literature.

Manufacturers of
All American Vibration Fatigue Test Machines

ALL AMERICAN Tool & Manufacturing Co.
8039 Lawndale Avenue, Skokie, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 88B

MEASURING LIGHT WAVE LENGTHS MADE EASY

The installation of the Zeiss Opton Interferometer by the Webber Gage Co. in its Cleveland, Ohio Standard Laboratory has made the measuring of light wave lengths a task anyone with a little bit of training can do.

Scientists have known that of all standards

Measuring light beams and inspecting surface finishings are done in this specially constructed Webber Standard Laboratory. The girl on the left can measure a beam of light to an accuracy of 1/10 of one millionth of an inch, thanks to the Zeiss Opton Interferometer. Her companion is shown inspecting a surface finish through a microscope that can bring out scratches less than 0.000001" in depth.

for obtaining an absolutely accurate measuring yardstick, only the wave length of light was unchangeable.

However, only highly trained scientists had the skill and instruments to make and interpret these measurements. Now with the Zeiss interferometer, a beam of light split in such a manner as to show the difference in phase between one beam and the other reflected off the surfaces to be measured is accurate to 1/10 of one millionth of an inch. The reading is taken off an interference pattern and can quickly be interpreted.

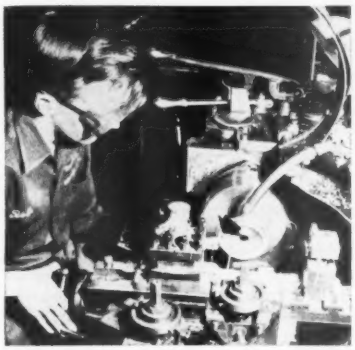
Along with the interferometer, Webber employs the Interference Microscope to inspect surface finish, the basis for all fine gage block accuracy. There is no mechanical contact whatsoever with the surface, hence no error due to breakdown or wear of scanning stylus.

One of the features of this instrument is that it not only determines the depth of any scratches, but also enables the operator to see the direction of their travel and even follow the path of any one individual scratch though it be less than .000001" in depth.

Webber's Standards Laboratory is housed in specially constructed rooms where all traces of air-borne dust are removed by electronic filters. Humidity and temperature are kept constant 24 hours a day and 365 days a year. These precautions are important in order to maintain the incredible accuracy of the interferometer.

Tool Life Is Increased 2400 Times

Cemented carbides have increased tool life 2400 times at Master Machinery Builders. This firm was looking for a way out of a very expensive dilemma — namely the discarding of steel cutting tools at the rate of more than one tool per acceptable part.



This operation at Master Machinery Builders, shows how grade 78B carbide cutting tool (note arrow) moves in on first operation — machining outside diameter on highly abrasive aluminum-bronze die casting. After finishing this surface, operator sets his indicator and other operations are measured from this first cut.

Carboloy, grade 78B, cemented carbide cutting tools apparently are the answer at this plant. With these tools, over 200 parts are produced.

A second problem solved by the grade 78B was that of producing fine finishes on a highly abrasive aluminum-bronze die casting.

This is a highly specialized job, with complete machining of a single part requiring about seven hours. The work, done on a Warner & Swasey No. 3 turret lathe, involves the use of special jigs and fixtures to handle a sequence of 40 operations such as turning, facing, boring, chamfering and reaming.

Eight of these operations are performed with a standard carbide single-point tool. The first operation is an outside turning job and is followed up wth boring and reaming, requiring the use of a special jig. The turning operation is run at 560 sfpm as are the subsequent facing operations, some of which involve two tools facing both sides of the work simultaneously.

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"O" RING GROOVES
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GROOVE
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Checks out-of-round, spherical radii—recesses.
Use as dial bore gage, blind holes—taper.
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CIRCLE INFORM-A-GRAM KEY NO. 89B

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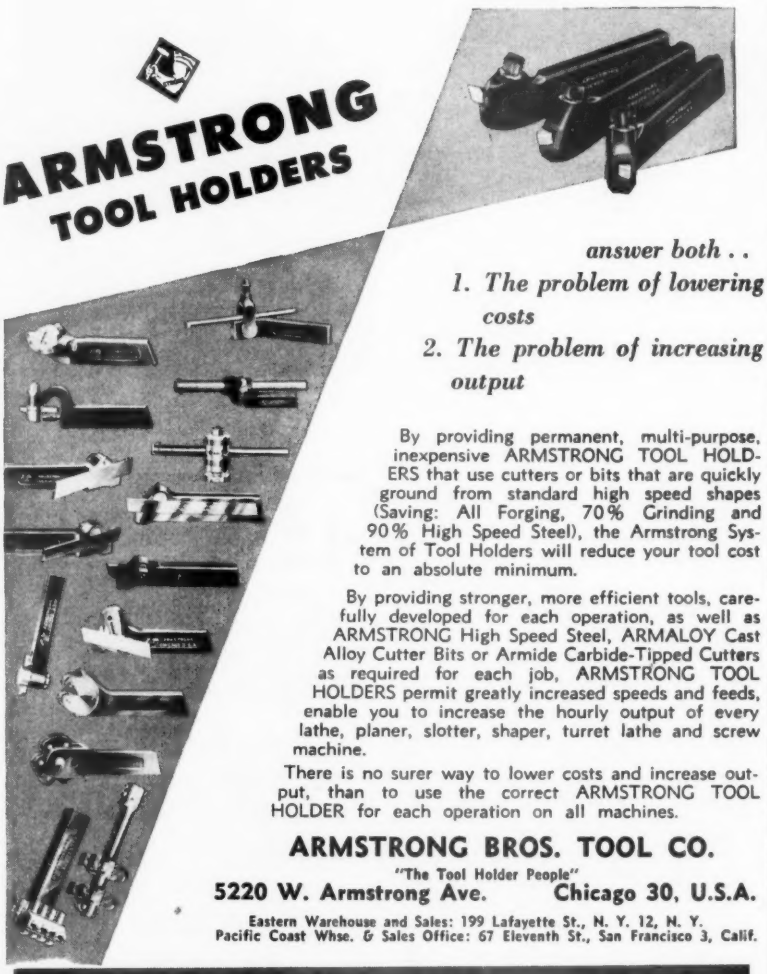
PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

"Visual" Plant Layouts, Inc., Pennsylvania Ave. at River, Oakmont, Allegheny County, Pa., announces that its new 1954 catalog is ready for release. This catalog, not only completely details "Visual" equipment supplied, together with prices — but explains the new system under which "Visual" plant layouts can be purchased.
Circle Inform-A-Gram No. B1.

New Optical Comparator. A completely new advanced design precision optical comparator, known as the Model R-300, has just been announced as an addition to the line of comparators and projectors manufactured by Portman Instrument Co., Inc., Town Dock Rd., New Rochelle, N. Y. A booklet pertaining to the new model is available upon request.
Circle Inform-A-Gram No. B2.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answer both . .
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By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.
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There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.
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Pacific Coast Whse. & Sales Office: 67 Eleventh St., San Francisco 3, Calif.
CIRCLE INFORM-A-GRAM KEY NO. 90

Roller Lapping Machine. Experience shows that this machine can do more accurate mirror-finish lapping in 1/3 the time with a minimum of rejections. You can read all about it in a new bulletin offered by the Spitfire Tool Co., 2931-35 N. Pulaski Rd., Chicago 41, Ill. Specifications included.
Circle Inform-A-Gram No. B3.

The Wej-Lok Tool Holder gives unusual advantages for holding of cutting tools. Complete details on this unique unit is offered by the Detroit Reamer Tool Co., 2830 E. Seven Mile Rd., Detroit 34, Mich.
Circle Inform-A-Gram No. B4.

Special Nails, Rivets, Screws. If John Hassall hasn't made a fastener you might need, very possibly the firm can design one. The company has a booklet available on special nails, rivets, screws, etc., which includes specifications, operation data and dimensional tables. Write to John Hassall, Inc., Westbury, Long Island, N. Y., or—
Circle Inform-A-Gram No. B5.

Horizontal Shaving Machines for large external gears are the subject of a 16-page two-color illustrated catalog (No. S-54-2) now available from the National Broach & Machine Co., 5600 St. Jean, Detroit 13, Mich. Concise operating descriptions and application data are included as well as specifications and a capacity table for the various models.
Circle Inform-A-Gram No. B6.

"Surfcenter." A radically new super precision universal test center which weighs only 21 lbs. and is 12" long has been announced by the Inspection Devices Co., 5636 Lake Park Ave., Chicago 37, Ill. This instrument may be used on any surface plate in vertical, horizontal or angular position, without use of special indicator bases or clamping on of angle plates. Inspection Devices has literature explaining all.
Circle Inform-A-Gram No. B7.

Reamers With Interchangeable Heads have the following advantages: They cut replacement cost; quick change of heads saves time; easy to change heads for different models, increasing efficiency; and wide range of sizes, and left handed spiral flute. Illustrations and specifications are included in a booklet that gives detailed coverage of these reamers. The literature is yours for the asking from The Tomkins-Johnson Co., Jackson, Mich.
Circle Inform-A-Gram No. B8.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

A Simplified Dust Control System for collecting three different kinds of dusts in small shops is the subject of Bulletin 640, No. 2, issued by the Aget-Detroit Co., 213 Main St., Ann Arbor, Mich. The bulletin illustrates installation and relates how emery dust; dust from rough grinding operation and lint from a buffer are controlled by a standard Dustkop dust collector.
Circle Inform-A-Gram No. B9.

Motor-Spindle Drilling. Bulletin 150 describes in detail the improved Model M.S. motor spindle drilling and tapping machines made by the Edlund Machinery Co., Cortland 38, N. Y. Concise tables in this illustrated publication provide pertinent engineering data and machine specifications.
Circle Inform-A-Gram No. B10.

Production Feeding. The Wittek Mfg. Co., 4305-15 W. 24th Place, Chicago 23, Ill., has just issued a condensed bulletin illustrating and describing its production feeding equipment for punch presses. The bulletin covers the use and application of the Wittek automatic roll feeds, stock straighteners and reel stands.
Circle Inform-A-Gram No. B11.

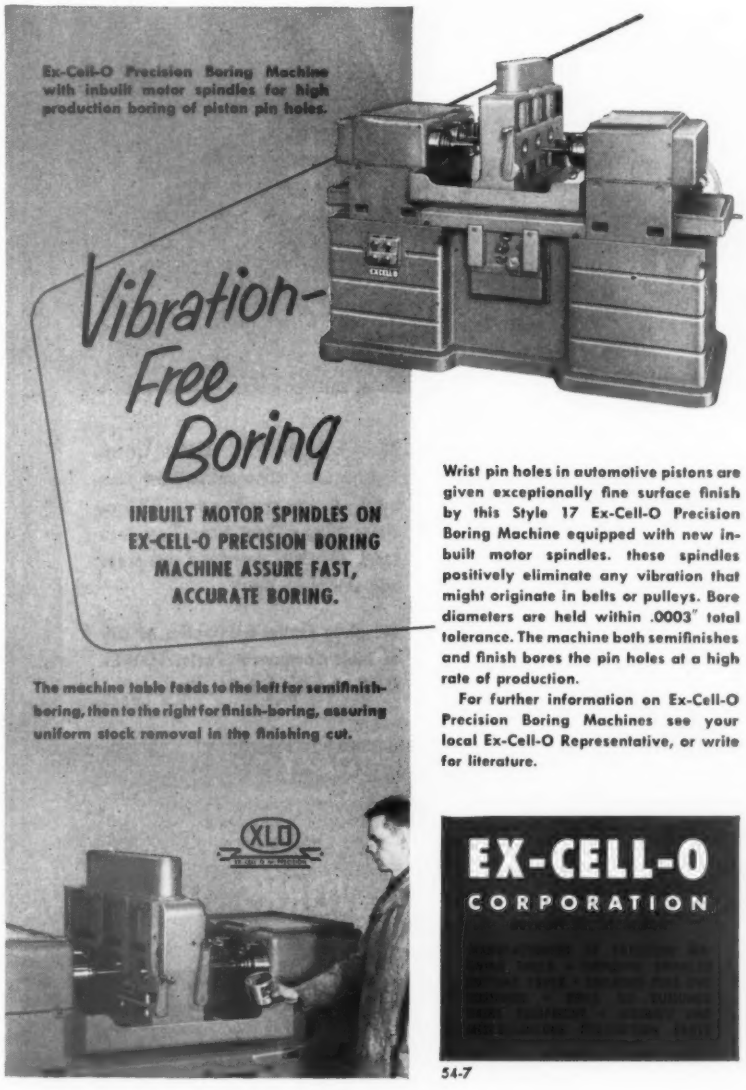
Development of a New Cam Operating Index Unit to provide precision positioning between automatic production stations or to provide simplified means of timing production drives is related in an illustrated brochure available from the Standard Tool & Mfg. Co., 740 Schuyler Ave., Lyndhurst, N. J.
Circle Inform-A-Gram No. B12.

Press Room Equipment. Slide feeds, roll feeds, straighteners, stock reels, coil cradles, oiler-wipers and scrap choppers are illustrated and described in Bulletin No. 80, now available from U. S. Tool Co., Inc., Ampere (East Orange) N. J. Drawings, specifications and information for ordering press room equipment also are included in this brochure.
Circle Inform-A-Gram No. B13.

Coordinate Comparator. The Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill., announces the publication of a new Bulletin No. 191-53 describing the M1233 Coordinate Comparator. This instrument is used for measurement and evaluation of photographic plates. Having a range of 255 mm x 255 mm and reading direct to 0.001 mm, it can be used for most linear and coordinate measurements of photographic records.
Circle Inform-A-Gram No. B14.

How To Cut Friction 85% with Cleveland Pneumatic Ball Screws is explained in a brochure now available from the company. Present and future applications of the ball screw plus a definition of the screw and illustrations also are contained. Write to the Cleveland Pneumatic Tool Co., 3781 E. 77th St., Cleveland 5, Ohio, or—
Circle Inform-A-Gram No. B15.

Magno-Therm Oxygen Recorder. The Hays Magno Therm Oxygen Recorder consists of an analyzing section electrically connected to a remote mounted recording section. A bulletin now available from the firm shows the operation of each section and discusses each separately. Write to the Hays Corp., Michigan City, Ind., or—
Circle Inform-A-Gram No. B16.


Ex-Cell-O Precision Boring Machine with inbuilt motor spindles for high production boring of piston pin holes.
Vibration-Free Boring
INBUILT MOTOR SPINDLES ON EX-CELL-O PRECISION BORING MACHINE ASSURE FAST, ACCURATE BORING.
The machine table feeds to the left for semifinish-boring, then to the right for finish-boring, assuring uniform stock removal in the finishing cut.
XLO
Wrist pin holes in automotive pistons are given exceptionally fine surface finish by this Style 17 Ex-Cell-O Precision Boring Machine equipped with new inbuilt motor spindles. these spindles positively eliminate any vibration that might originate in belts or pulleys. Bore diameters are held within .0003" total tolerance. The machine both semifinishes and finish bores the pin holes at a high rate of production.
For further information on Ex-Cell-O Precision Boring Machines see your local Ex-Cell-O Representative, or write for literature.
EX-CELL-O
CORPORATION
54-7

CIRCLE INFORM-A-GRAM KEY NO 91

Bench Grinders. Universal, Semi-Universal, and Plain super precision bench grinders are well illustrated and described in this booklet now available from Crystal Lake Grinders, Crystal Lake, Ill. Specifications and dimensions included.
Circle Inform-A-Gram No. B17.

Transfer-Type Machine. This machine for drilling, chamfering, boring and tapping is illustrated and described in literature available from the Michigan Drill Head Co., 971 E. 8 Mile Rd., Hazel Park (Detroit) Mich.
Circle Inform-A-Gram No. B18.

Metallizing, its practical applications, case histories and recommended methods are the subject of literature available from Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y.
Circle Inform-A-Gram No. B19.

Unloader. Designed for the automatic unloading of small and medium size parts from presses and other metalworking machines, the Sahlin unloader can be supplied with either fixed or roll-away base. Complete literature is available from Sahlin Engineering Co., Birmingham, Mich.
Circle Inform-A-Gram No. B20.

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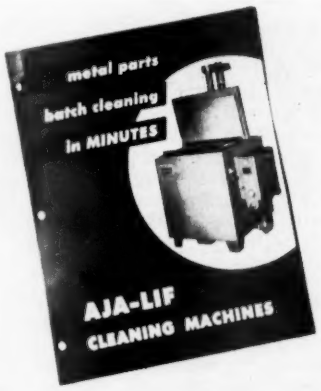
CIRCLE INFORM-A-GRAM KEY NO. 92

Metal Parts Batch Cleaning In Minutes. This bulletin describing the Magnus Aja-Lif cleaning machines will be of interest to all who are



seeking modern and economical cleaning methods to reduce cleaning time and costs. For your copy of Bulletin 704-AL write to Magnus Chemical Co., Inc., Equipment Div., Garwood, N. J., or—
Circle Inform-A-Gram No. B21.

For Highly Polished Expensive Surfaces, "Protecto-Mask" provides a tough scratch-proof, stain-proof, protective covering. A brand new folder describing this product is available from Mystik Adhesive Products, 2673 N. Kildare Ave., Chicago 39, Ill.
Circle Inform-A-Gram No. B22.

Tap Catalog & Price List. A fully illustrated bulletin published by the Reiff & Nester Co., Lykens, Pa., provides complete data regarding sizes, flutes and prices for standard taps as well as many special taps at standard prices. If writing direct to the company ask for catalog 10.
Circle Inform-A-Gram No. B23.

A Revolving Die Head designed for application on the new No. 4 Model "C" Landmaco threading machine has been developed to meet the requirements for the precision threading of large diameter workpieces. Literature can be had from The Landis Machine Co., Waynesboro, Pa.
Circle Inform-A-Gram No. B24.

Tow-Line Systems for cost saving, "production line" materials handling in warehouses and freight terminals are described in a bulletin issued by the Nutting Truck and Caster Co., 1125 West Division St., Faribault, Minn. Illustrated are 13 different models of floor trucks, in a wide range of sizes, with five different types of tow mechanism for use either overhead or under-floor powered conveyors; also included are many operation sequence illustrations of recent cost saving installations.
Circle Inform-A-Gram No. B25.

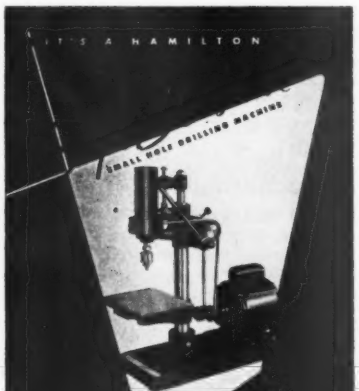
A New Tool Holder Bushing eliminates retaining rings and spring clips and greatly facilitates set-up on Brown & Sharpe automatics and similar machines. For further information and catalog write to Barnaby Mfg. Co., Inc., 74 Knowlton St., Bridgeport 3, Conn.
Circle Inform-A-Gram No. B26.

Hydraulic Cylinders. A new extensive line of hydraulic cylinders has been announced by the Hydraulic Power Div., Hydraulic Press Mfg. Co., Mount Gilead, Ohio. For easy reference, HPM offers a catalog showing the features of the new cylinders.
Circle Inform-A-Gram No. B27.

Universal Live Center. Extreme accuracy and load carrying capacity beyond most usual requirements are claimed for a new medium priced live center introduced by Ideal Industries, Inc., 5186 Park Ave., Sycamore, Ill. An illustrated bulletin is available from the manufacturer.
Circle Inform-A-Gram No. B28.

Rubber Seals. A new 16-page brochure documenting in detail the production and application of rubber "O" ring seals has been published by Dept. KP Minnesota Rubber and Gasket Co., 3630 Wooddale Ave., Minneapolis 16, Minn. Included in the brochure are sections on end products, "O" ring sizes, dash numbers and variable tolerances, dimensional data for installation of standard size "O" rings, cross sectional drawings of correct and incorrect installations and methods of utilizing "O" ring sealing properties.
Circle Inform-A-Gram No. B29.

This Bulletin, AM-54, gives all of the features and specifications of the Hamilton A-M super sensitive



precision small hole drilling machine. It is available from the Hamilton Tool Co., Ninth St. at Hanover, Hamilton, Ohio.
Circle Inform-A-Gram No. B30.

A Toolholder that you can swing up and down and all around is offered by Seaboard Steel Company of America, Inc., 1775 Broadway, New York 19, N. Y. For literature write direct to the company, or—
Circle Inform-A-Gram No. B31.

Coil Loading Hooks for coils of 1,000 to 40,000 pounds. These hooks save time, save manpower, increase safety, speed production, stand hard use and reduce costs. Read all about them in literature available from the F. J. Littell Machine Co., 4127 Ravenswood Ave., Chicago 13, Ill.
Circle Inform-A-Gram No. B32.

Electric Actuators are reviewed in a 64-page catalog published by the AiResearch Mfg. Co., 9851 Sepulveda Blvd., Los Angeles 45, Calif. The descriptive booklet outlines the applications and specifications of 20 basic types.
Circle Inform-A-Gram No. B33.

Heating Elements for electric furnaces and kilns are featured in a "Hot Rod" bulletin prepared by the Norton Co., Refractories Div., Worcester 6, Mass. Technical data, uses and accessories of Norton Crystolon heating elements are given.
Circle Inform-A-Gram No. B34.

NEW
ROTOR PENCIL
AIR GRINDER

FOR DIES... PATTERNS... 1001 GRINDING JOBS

40,000 R.P.M.
POWERFUL!
Only 13 ounces
Handy
Rugged—Steel

THIS TOOL WILL PAY OFF FAST IN 1001 JOBS. ASK FOR BULLETIN NO. 42. AIR O'TOOL

SPECIFICATIONS

WEIGHT	13 ounces
LENGTH	5 3/4"
DIAMETER	1"
FREE SPEED	40,000 R.P.M.
COLLET	1/8" or 1/4"

Equipment (Standard)
8 ft. hose and air strainer. Push throttle. Collet wrench. 1/4" collet.

Equipment (Optional)
1/8" collet chuck
Steel rear head. 1/8" air inlet.
Steel rear head. (right angle). 1/4" inlet.
Tool post holder (extra cost).

AIR
HIGH CYCLE
THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

CIRCLE INFORM-A-GRAM KEY NO. 93

The New Helicarb Helical Carbide Slab Mills, developed for heavy stock removal on wide slab cuts, are described in literature available from the Sonnet Tool & Mfg. Co., 576 N. Prairie Ave., Hawthorne, Calif.
Circle Inform-A-Gram No. B35.

Applying Layout Ink. A new method of applying design layout ink, utilizing layout ink pens and a special bulk layout ink has been developed by Crown Industrial Products Co., 808 Amsterdam St., Woodstock, Ill. Literature on this unique method is available.
Circle Inform-A-Gram No. B36.

Chucking Reamers are illustrated and described in Bulletin 10 available from the 20th Century Mfg. Co., Libertyville, Ill. Discussed are Supeream reamers in decimal sizes.
Circle Inform-A-Gram No. B37.

Hydraulic Overload Pitman. Just off the press is a folder describing a hydraulic overload pitman which reportedly will eliminate such punch press troubles as bent or broken crankshafts; broken frames and broken tools and dies. The brochure is available from Dayton Rogers Mfg. Co., Minneapolis 7, Minn.
Circle Inform-A-Gram No. B38.

Sid Tool Company

WHY WAIT FOR SPECIAL TAPS?

. . . Has them IN STOCK for IMMEDIATE DELIVERY!

HIGH SPEED SPECIAL RIGHT HAND TAPS

SIZE	THREAD
4	32-48-60-64
5	30-32-36-48-80
6	36-40-48-56-60
7	32-40
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-18-20-24-26-27-28-32
13/16	10-14-18-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1 2	8-10-14-16-18-20-24-28
1-9/16	18-20-24
1-5/8	5½-8-10-12-13-16-18-20-24
1-11/16	10-12-14-16-18-20-24
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2-8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-½-8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
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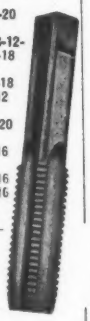
3-1/2	8-12-16
3-7/8	6
4	8-12



HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32
3/8	16-24-32
7/16	14-20-28
1 2	12-13-20-28
9/16	12-1·-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	9-12-14-18-20
1	9-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1-11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4½-10-12

• SPECIAL AND LEFT HAND DIES IN STOCK

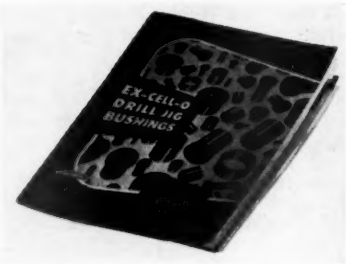
NOTE: Oversize, Undersize, Metric, 64th and 32nd Size Taps Available for Quick Delivery. We stock Special Sizes in High Speed Milling Cutters, Slitting Saws, End Mills, and Reamers

Dealer Inquiries Invited

• Are you on our monthly mailing list? Write Dept. T

SID TOOL COMPANY, INC.
CUTTING TOOL SPECIALISTS
126 LAFAYETTE STREET • NEW YORK 13, N. Y.
PHONE: BE 3-4270

CIRCLE INFORM-A-GRAM KEY NO. 94



A Drill Jig Bushing catalog containing a new conversion chart is now being offered by the Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Circle Inform-A-Gram No. B39.

A New Portable Lift Table in four load capacities of 1,000 to 6,000 pounds permits table top rotation through 360°. Temporary Bulletin No. 957 illustrates and describes this unit. The literature is available from the Lang Lift Co., 4275 N. 124th St., Milwaukee 10, Wis.
Circle Inform-A-Gram No. B40.

A Variable Speed Control for lathes and other machines powered by fractional and one-horsepower DC motors, has been announced by the Electro Products Laboratories, 4501 N. Ravenswood Ave., Chicago 40, Ill. Complete details and pictures can be had from the company.
Circle Inform-A-Gram No. B41.

A New Ball Micrometer has been announced by the AA Gage Co., 356 Fair St., Detroit 20, Mich. This ball micrometer is used in place of separate rolls in checking non-parallel parts and is especially useful in checking tooth thickness and pitch diameter gears. Full data can be obtained from AA Gage.
Circle Inform-A-Gram No. B42.

Die Polishing Machine data, including specifications, operation and description are contained in this illustrated brochure put out by the Hartford Special Machinery Co., Hartford 5, Conn. This machine, which is completely motorized, can accommodate almost any style of die, such as dies used in drawing rods, bars and tubing, as well as deep drawing dies.
Circle Inform-A-Gram No. B43.

Multiple Plunger Pillar Presses are given extensive coverage in a booklet recently published by the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Complete specifications and capacities are given in tabular form for six sizes of presses. The bulletin also illustrates several sizes of the machines and pictures examples of the type of work produced on them. Close-up views show details of important portions of the tooling arrangment.
Circle Inform-A-Gram No. B44.

Bolster Bolts with a tensile strength of 149,500 psi minimum are now being manufactured by the West Point Mfg. Co., 26935 W. 7 Mile Rd., Detroit 19, Mich. These bolts are made to J.I.C. standards and come in lengths from 4" to 22". Literature is available on description and prices.
Circle Inform-A-Gram No. B45.

A Portable, Ultrasonic Instrument for measuring the thickness of steel sheet where only one surface is available, for checking the continuity of bonds and for testing raw stock for laminar defects has been put on the market by Sperry Products, Inc., Danbury, Conn. The firm offers complete descriptive literature.
Circle Inform-A-Gram No. B46.

Precision Vernier Height Gage. This instrument has a moveable main scale for measuring up or down from any given point. Other features, plus illustrations and specifications are contained in a catalog offered by the Brand Tool & Supply Co., 907 S. Victory Blvd., Burbank, Calif.
Circle Inform-A-Gram No. B47.

The Ultrasonic Machine Tool that "magically" machines the hardest of materials is illustrated and described in a bulletin available from the Sheffield-Cavitron Div., Sheffield Corp., Dayton 1, Ohio. Machining on this unit is accomplished without changing, in any way, the surface appearance, physical properties, chemical, electrical, magnetic or metallurgical character of the material. Data in the literature includes specifications and applications.
Circle Inform-A-Gram No. B48.

For Measuring Surface Roughness. Micrometrical Mfg. Co. has this illustrated bulletin available describing the firm's in-plant demonstration

Yours for the asking . . .
A Profilometer Demonstration in your plant!
This bulletin will tell you all about it — and why I'm sure you'll find it interesting

service on the Profilometer. Copies can be had on request from Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich.
Circle Inform-A-Gram No. B49.

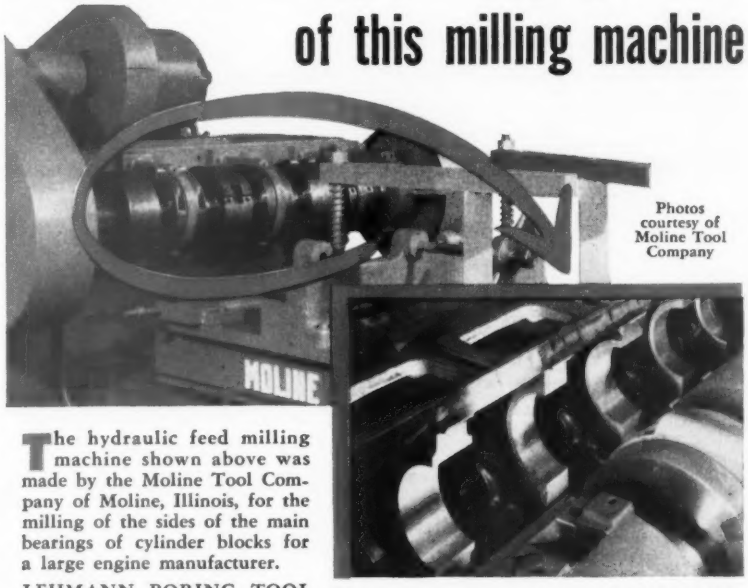
Band Saws. Hard edge flexible back band saws made by W. O. Barnes Co., Inc., 1297 Terminal Ave., Detroit 14, Mich., are illustrated and described in a circular now available.
Circle Inform-A-Gram No. B50.

Air Chucks & Air Cylinders are principal features of a new brochure currently available from the Whiton Machine Co., Howard St., New London, Conn. Also described is the Whiton Micro jaw set, an unusual accessory which provides precision adjustment of chucks having American Standard serrated type jaws.
Circle Inform-A-Gram No. B51.

Tapping Machines built for heavy duty precision service are illustrated and described in a bulletin available from the Kaufman Mfg. Co., Manitowoc, Wis. Described is a hydraulic combination drilling or tapping unit in a single-head machine.
Circle Inform-A-Gram No. B52.

Clutches. Basic construction, installation and lubrication are some of the technical points covered in an illustrated catalog on over-running, indexing and backstopping clutches issued by the Formsprag Co., 23601 Hoover Rd., Van Dyke, Mich.
Circle Inform-A-Gram No. B53.

Tools from LEHMANN BORING TOOL used in the multiple facing operation of this milling machine



Photos courtesy of Moline Tool Company

The hydraulic feed milling machine shown above was made by the Moline Tool Company of Moline, Illinois, for the milling of the sides of the main bearings of cylinder blocks for a large engine manufacturer.

LEHMANN BORING TOOL furnished the precision bars, heads and tungsten carbide cutters circled above which machined the multiple straddle facing operation. The close-up view at the right shows the bottom of the cylinder block and the sides of the main bearings after milling.

You can depend on LEHMANN

- For technical tooling help — for interchangeability, economy and accuracy in all your boring tool needs, whether simple or complicated.
- 35 years top engineering experience, with a wide range of practical ability to assure successful application to your needs.
- Write for Catalog BT-12, or tell us your problems for an estimate without obligation.

LEHMANN BORING TOOL

DIVISION OF NOVO ENGINE CO.
4389 Duncan Ave., St. Louis 10, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 95

Profile Grinder. The Rice Pump & Machine Co., Belgium, Wis., offers an illustrated bulletin on a machine for high-speed precision grinding of external and internal contours, curved, odd and irregular surfaces.
Circle Inform-A-Gram No. B54.

Rotorseals for trouble-free transmission of air, liquids or gases are illustrated and described in a bulletin put out by the Fawick Airflox Div., Federal Fawick Corp., 9919 Clinton Rd., Cleveland 11, Ohio. Included in the brochure are specifications and dimensions.
Circle Inform-A-Gram No. B55.

A New Oil Recovery Unit reduces manufacturing costs and avoids water pollution. Read all about it in literature now available from the Pioneer Pump Div., Detroit Harvester Co., 2750 Guardian Bldg., Detroit 26, Mich.
Circle Inform-A-Gram No. B56.

Designed for Maximum Rigidity, the new type Schmaltz APF double column way grinders can also be used as regular surface grinders. Literature on the machines is available from Parker Machine Co., Inc., 158 Pioneer St., Brooklyn 31, N. Y.
Circle Inform-A-Gram No. B57.

COMBINED OPERATIONS... CUT COSTS..

MOHAWK SUBLAND DRILLS

2 to 11 Operations Simultaneously Accomplished

The Subland type taper roughing reamer eliminates more than 70% of the torque encountered with conventional type taper roughing reamers because it is a right-hand spiral, freely end cutting tool. This reduction of torque eliminates flute breakage and wedging which lengthens tool life by as much as ten times. At the same time, with a Subland, the job can be done two to five times faster, leaving a cleaner hole for the finishing reamer. Properly applied, a Subland can accomplish two to eleven operations at one time. Send part, print, tool layout, shank and over-all length requirements for prints and prices. Let Mohawk cut your production costs with properly applied Sublands.

Subland Taper Roughing Reamer (2-2-2-2-2-2) which works like a core drill to effectively rough your tapered hole.

SEE JUNE ISSUE FOR SUBLAND DRILL-CHAMFER

Mohawk TOOLS, Inc.
910 E. MAIN ST., MONTPELIER, OHIO

world's largest producer of Sublands

CIRCLE INFORM-A-GRAM KEY NO. 96

BLACK
VISE
A
Precision
TOOL
for locating centers or other predetermined points regardless of shape or varying sizes of parts, within .001"
HORIZONTALLY AND VERTICALLY
BLACK DRILL COMPANY, INC., 1400 E. 222nd St., Cleveland 17, Ohio

"Center-Finder" Vise. A bulletin illustrating and describing the "Center-Finder" vise has been made available by the Black Drill Co., Inc., 1368 E. 222nd St., Cleveland 17, Ohio.
Circle Inform-A-Gram No. B58.

Use of a Live Head which rotates freely on the stock stop during screw machine and turret lathe operations completely eliminates marring of the finished end during stock feed. For complete information write to Barnaby Mfg. Co., 74 Knowlton St., Bridgeport 8, Conn., or—
Circle Inform-A-Gram No. B59.

Fabricating Sheet Metal. A reference book illustrating and describing machines, tools and dies for fabricating sheet metals (Catalog 154) is now being offered by the Ward Machinery Co., 564 W. Washington Blvd., Chicago 6, Ill. The equipment described is confined to products of nationally known manufacturers for whom Ward is the recognized distributor.
Circle Inform-A-Gram No. B60.

Specialized Production Equipment. "Engineering Excellence that does the never-before now" is the theme of this looseleaf catalog in which 18 representative special machines are illustrated and detailed. Tooling and the parts processed by each piece of specialized equipment, also are shown. The booklet is published by the Peerless Production Co., 19451 Glendale, Detroit 23, Mich.
Circle Inform-A-Gram No. B61.

Lathes. A 36-page booklet featuring Axelson lathes is now ready for distribution. Featured are the Axelson foundry, engineering and design departments, metallurgical control and machining operations. The reader will get a good idea of the methods and procedures behind the production of heavy duty precision lathes. The booklet is available from Axelson Mfg. Co. Div., Pressed Steel Car Co., Inc., 6160 S. Boyle Ave., Los Angeles 58, Calif.
Circle Inform-A-Gram No. B62.

Easco Etcher & Demagnetizer. Full details, including operating instructions on this four-in-one unit are given in Bulletin 544 available upon request from Electro Arc Sales Co., 5270 Geddes Rd., Ann Arbor, Mich.
Circle Inform-A-Gram No. B63.

'Spindles & Needles.' If faulty machining has you on 'spindles and needles' so to speak, the Whitnon Mfg. Co., New Britain, Conn., offers an answer in its new catalog of Spindle Ideas for getting the most out of your present machines.
Circle Inform-A-Gram No. B64.

The Superfinishing Process has made tremendous strides in the past few years and a new catalog recording this progress is just off the press. It includes a brief description of the process; complete specifications on the 12 machines and five attachments available for this work; plus information and photographs on 28 different job applications. Write for Form 1169 to Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis., or—
Circle Inform-A-Gram No. B65.

Burnishing & Pivot Polishing Machines, embodying the latest advances for extremely accurate sizing, are illustrated and described in a bulletin available from Carl Hirschmann Co., Inc., 30 Park Ave., Manhasset, N. Y. The booklet shows how the machines combine work-hardening, minute shaving and polishing into one single operation. Also, it pictures numerous typical jobs, for which total machining times are given in seconds.
Circle Inform-A-Gram No. B66.

You Are Invited! To get acquainted with R. Krasberg & Sons Mfg. Co., 2501 Homer St., Chicago, Ill. They make tools, dies, gages and stamp-

ings and in a light hearted, but informative manner introduce you to the people who make the products and to the products themselves.
Circle Inform-A-Gram No. B67.

Standard Carbide Tools. Information on carbide grades, applications and late developments in the carbide field are contained in literature now available from the Adamas Carbide Corp., Kenilworth, N. J.
Circle Inform-A-Gram No. B68.

Mechanical Data Book. This publication contains complete information on centrifugal coolant pumps and hydraulic piston-type oil relief valves made by the Fulflo Specialties Co., Inc., Blanchester, Ohio. You can write direct to the company for your copy, or—
Circle Inform-A-Gram No. B 69.

Information on precision horizontal bench milling machines is available in a folder offered by Elgin Tool Works, Inc., 1770 Berteau Ave., Chicago 13, Ill.
Circle Inform-A-Gram No. B70.

Machine Vises. Now available is a precision vise constructed for such heavy duty work as milling, drilling, grinding and other machine operations which require a rugged holding device. Complete details will be furnished by the Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill.
Circle Inform-A-Gram No. B71.

When you "SAVE"...
YOU LOSE!

"Saving" by making your own punches is old-fashioned and expensive.

Here's why:

1. PORTER PUNCHES are available for immediate delivery.
..... they save time — money — by keeping your expensive help at profitable jobs.
2. PORTER PUNCHES are made to "stand the gaff."
..... punches made in your shop are probably made from "available" material . . . often the wrong metal for the job.
3. PORTER PUNCHES are offered in standard—and decimal sizes.
..... so your experienced help doesn't spend costly time "whittling."
4. PORTER PUNCHES are reasonably priced.
..... only a "specialist" can make punches as well—or as inexpensively.

Check your labor costs — your "down-time"— and order
PORTER PUNCHES
— for immediate delivery.
Save time — save money — with top quality punches and die buttons.
Look to Porter for
the punch you need... when you need it!
Remember — you don't save by making your own punches — you lose.

"Still the best performer"

PORTER PRECISION PRODUCTS
PRinceton 6338 P.O. Box 208
Cincinnati 15, Ohio
Porter Punches are in stock in all principal cities.

CIRCLE INFORM-A-GRAM KEY NO. 97

compare YOUR drill fixture COSTS with ANCHOR BUSHING templates

Anchor Bushing drill templates, using sheet metal or laminate plastic materials, are made flat or in compound curved forms at a fraction of cost and time required for similar conventional drill fixtures.

Your TOOLING COSTS are reduced in simplified design and fabricating methods. Your MATERIAL DOLLARS go further by using inexpensive hardened steel Anchor Bushings and sheet metal or plastic materials. Your PRODUCTION JOB TIME is conserved since lightweight Anchor Bushing templates reduce worker fatigue and storage problems.

Compare your drill tooling methods, as have leading aircraft tooling departments, with the Anchor Bushing Method.

Ask today for our Anchor Bushing Catalog – it describes methods, bushing styles, sizes and prices.

Solar Aircraft Company, San Diego, craftsmen use contoured Anchor Bushing drill template on nacelle of Lockheed P2V Neptune aircraft.

Standard Anchor Bushings for rivet or spot weld attachment to sheet metal or fiberglas.

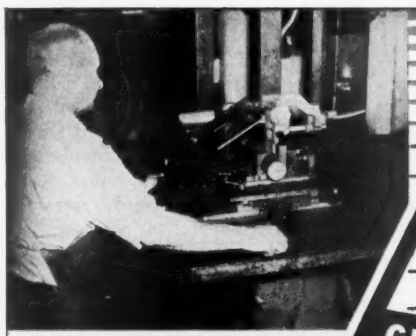
Nutplate Anchor Bushings provide three coordinated screw and rivet attachment holes in one bushing.

One piece Anchor Bushings for laminate plastic materials. Imbedded into plastic before heat hardening process.

THE *hi-shear* RIVET TOOL COMPANY

8924 BELLANCA AVENUE • LOS ANGELES 45, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 98A



FRICTION SAWING WITH Tannewitz HIGH SPEED BAND SAWS

GREATEST COST SAVER IN METAL CUTTING

Tremendous savings of time and money are effected in trimming formed parts with Tannewitz High Speed Band Saws, for not only are the cuts made exceedingly fast, and smoothly, but in most cases no jigs or rests of any kind are required. Sheets of both hard and soft steel, and even such metals as 1" armorplate are handled with great advantage by this method, and it is ideal for trimming malleable and steel castings. By all means get the complete facts and learn of the many opportunities for boosting production and lowering costs that Friction Sawing with Tannewitz High Speed Band Saws offers. Write for circular.

for trimming castings of all metals write for bulletin on "Foundry Band Saws".

☎ GL-6-1729

SAWING MACHINERY SPECIALISTS

The TANNEWITZ WORKS GRAND RAPIDS MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 98B

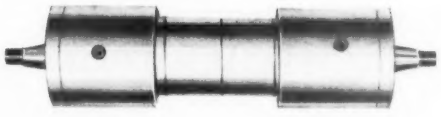
We can NOW supply the correct
PRECISION SPINDLE
. . . for every grinding job

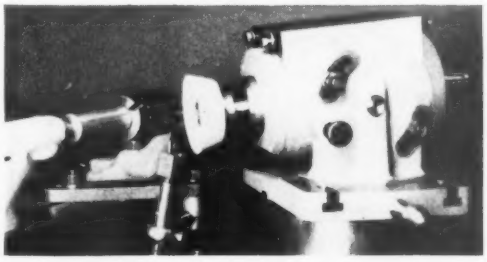
Bearings, Inc. is an authorized distributor of finest spindles for every purpose

POPE PRECISION SPINDLES

The Pope Precision Grinding Spindles are prime examples of mechanical ingenuity and production skill. They give you:

1. Constant Production of Finely and Uniformly Finished Surfaces.
2. Cool Operation at High Speeds Over Long Periods.
3. Permanently Lubricated — Permanently Preloaded. No oiling or greasing. Nothing to renew, replace or adjust throughout the entire life of the bearings.





WHITNON GRINDER SPINDLES Heavily spring preloaded to keep spindle radially and axially rigid. Sparks out fast, leaving an excellent finish. Rigid enough for crush dressing and perfect contour grinding. Constant adjustment from spring preload keeps spindle rigid regardless of wear or temperature change.

AKRON — CANTON — CINCINNATI
CLEVELAND — COLUMBUS — DAYTON — ELYRIA
HAMILTON — LIMA — MANSFIELD
TOLEDO — YOUNGSTOWN — ZANESVILLE

MEMBER AFBDA ANTI-FRICTION BEARING DISTRIBUTORS ASSOCIATION

Bearings, Inc., 3634 Euclid Avenue,
Cleveland 15, Ohio

Gentlemen:

Please send me further information on
☐ Pope Precision Spindle ☐ Whitnon Grinder Spindle

Name_____

Firm_____

Address_____

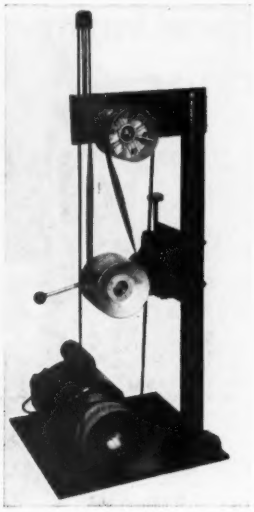
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 98.1

TONGUE SANDER IS IDEAL FOR SMALL I. D. WORK

A machine offering a great variety of applications is the tongue sander designed for the small I.D. sanding of miscellaneous metal parts. In and around the Indianapolis area, several plants are successfully producing finished work on these machines.

Specifically, the tongue sander is now being used to sand the I.D. of bomb straps, cut-outs, horn rings, jeep gas tank necks and the like.



Successfully used for sanding the flash in the rings of forged tin snips is this tongue sander.

The model pictured above was built by the Behr-Manning Corporation and has been successfully used to sand the flash in the rings of forged tin snips. It uses a ½" x 132", 80-X Resinall Metalite cloth belt; and, because the nose pulley is only 7/8" in diameter and 9/16" wide, it is easy to see no difficulty was encountered in sanding the 2-3/8" long by 1-1/4" wide ring in the tin snips. To allow greater work pressure, a small platen was placed in back of the belt.

In many applications, Behr-Manning found it unnecessary to use a nose pulley bearing as small in diameter (7/8") as the 38 KTT Fafnir bearing which was used on the model pictured here. So, bearings of greater diameter were tested and it was reported the larger the diameter, the less bearing trouble users of the tongue sander will encounter.

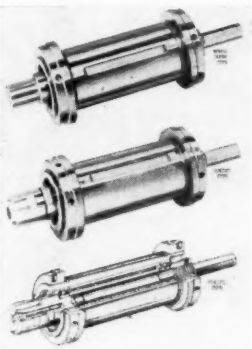
In the event belts wider than 1/2" are considered for use, it is recommended that two bearings be pressed into a crowned sleeve to be used as the nose pulley. When a single bearing is used as the nose pulley, Behr-Manning grinds a crown into the outer race to facilitate belt tracking. The belt, also, is twisted over the backstand idler pulley to prevent the grain side from abrading the pulley.

Inside contours on tin snips are blended on a tongue sander which uses a ½" Metalite cloth belt.

Power for the tongue sander is furnished by a 1725 rpm, 3/4 hp single phase, 110-220 volt, AC, fully enclosed motor which was used with a 5-1/2" diameter pulley that generated 2600 sfpm belt speed.

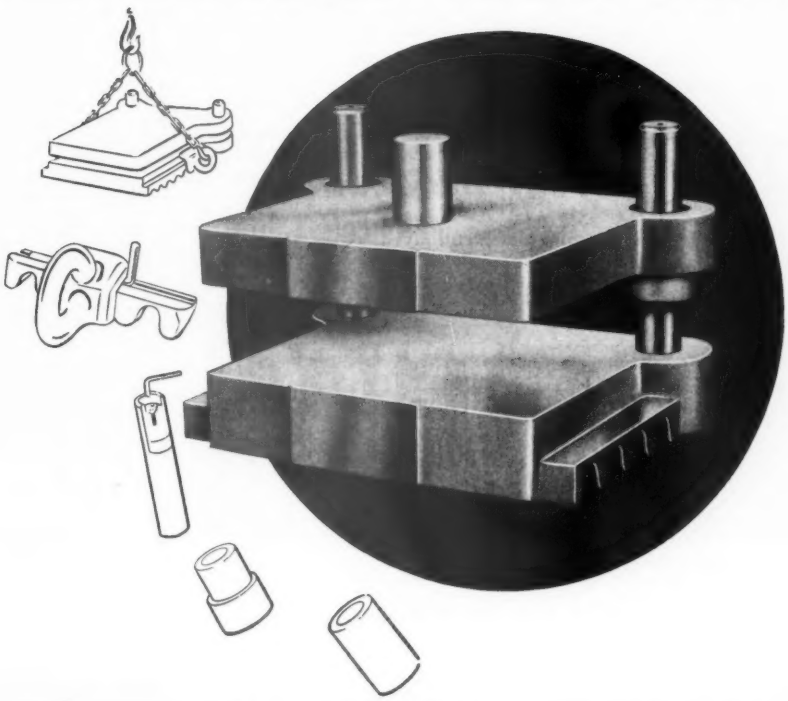
NEW SPINDLE LINE SPEEDS SPECIAL MACHINE BUILDING

A new line of mass-produced standard spindle assemblies, which can be used profitably to simplify designing and the manufacturing of special machines has been introduced by Russell T. Gilman, Inc., 2410 N. Farwell Ave., Milwaukee 11, Wis. Drills, reamers, taps, end mills and other tools of similar sizes can be accommodated on these spindle assemblies at a substantial savings in time and cost. Spindle sockets are furnished for either a #10 or #1 Morse taper shank, or ⅛", 3/16" or ¼" maximum capacity collets. Overall dimensions of the spindle assemblies run from 4⅝" to 8" length and from 1⅝" to 2½" diameter.



Circle Inform-A-Gram Key No. F1.

FAMOUS SUPERIOR DIE SETS NOW AVAILABLE FROM JERGENS



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Superior Die Sets and Accessories are distinguished for their long, accurate press runs—their precision manufacture of quality materials and for their exclusive safety features which safeguard against injury to handlers plus easier lifting and manipulating.

All these quality Superior features mean time, material and labor savings for you.

Write for complete specifications and price list.

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TOOL SPECIALTY CO.

712 E. 163rd St. CLEVELAND 10, OHIO
KEnmore 1-2015

CIRCLE INFORM-A-GRAM KEY NO. 98.3

New Machines Test Strength of Auto Axles

Newly-developed machines for testing automobile axles are so tough they can twist a steel shaft until it resembles a corkscrew.

Members of Ford Motor Company's engineering staff at Dearborn, Mich., use the machines, called axle dynamometers, to place heavy loads on axle assemblies for long periods to test their strength and determine the point of breakdown.

Before a complete axle failure occurs, technicians can discover weak spots in the metal structure or design by means of contact microphones attached to each dynamometer.

The microphones, similar to those used on electric guitars, amplify the sounds of a forthcoming breakdown and relay them to a control tower.

For example, when a gear tooth approaches the breaking point under the stress put on it by the dynamometer, it gives a tapping sound.

In a typical heavy-duty test, technicians "run" axles under maximum loads for 1,500 hours in a 12-week period. This is the equivalent of about 50,000 miles over the road.

While tests are in progress, technicians check axle loads, speeds and temperatures by means of automatic devices. After being tested, each assembly is taken down for examination of its parts and its resistance to fatigue.

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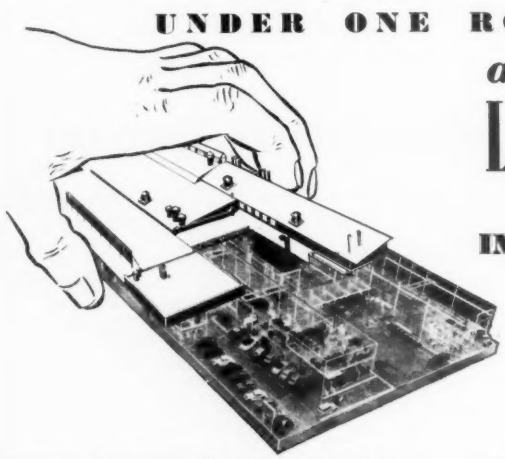
CIRCLE INFORM-A-GRAM KEY NO. 98.4A



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How can *one source* more completely — and more economically — serve *all* of your steel treating needs? For the *complete range* of scientific steel improvement services there is *one plant* in your area — where the application of scientific method to scheduling, material handling and controlled production lowers your costs on a better job. This is the Lakeside plant. So for large or small quantities — from giant parts to handfuls — you'll find Lakeside's facilities your best choice for *complete service.*

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CIRCLE INFORM-A-GRAM KEY NO. 98.4B

300-PAGE CATALOG GIVES COMPLETE BEARINGS, INC. DATA

Bearings, Inc., 3634 Euclid Avenue, Cleveland, Ohio, who distribute 48 lines of bearings and bearing specialties, have announced the issuance of a new 300 page catalog giving complete

information on every size and type of bearing distributed by them.

The catalog is being made available to buyers and shopmen who have a continuing need for this type of information.

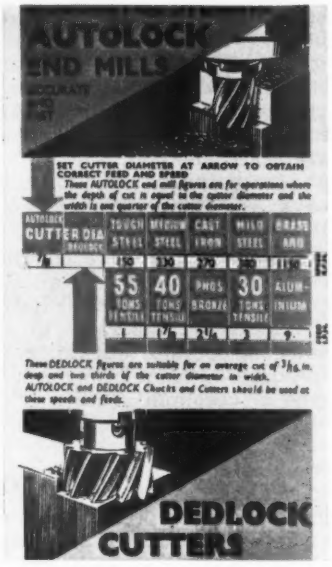
Bearings, Inc. also issue, from time to time, catalogs on specific types of bearings and bearing specialties.

Bearings, Inc. operates 28 branches in Ohio, Indiana, Pennsylvania, West Virginia, New Jersey and Kentucky.

Inform-A-Gram Key No. F2.

Use postage-free Inform-A-Gram Key Number Card for your request

OPERATOR'S SLIDE RULE



This calculator gives speeds and feeds at a glance for milling operations. Readings are given for tough steel, medium steel, cast iron, phosphorous bronze, mild steel, brass and aluminum. It is offered by Clarkson, Inc., 320 Ontario St., Toledo 2, Ohio.
Circle Inform-A-Gram No. C1.

Machinability of Free Cutting Brass is compared with that of leaded steel in a 48-page booklet just published by Titan Metal Mfg., Bellefonte, Pa. Complete with charts and diagrams, the booklet depicts brass and leaded machinability as measured by wear on cutting and drilling tools.
Circle Inform-A-Gram No. C2.

Cutting and Grinding Procedures. Here is a pocket size 44-page booklet on cutting and grinding procedures. It contains charts and graphs showing recommended concentrations for machining different metals in all metal-working operations, as well as comprehensive technical data pertaining to increase production and prolong tool life. For your copy write to Master Chemical Corp., 13 Huron St., Toledo 1, Ohio, or—
Circle Inform-A-Gram No. C3.

Friction Sawing. General information on the friction sawing of sheet steel, non-ferrous metals, armor plate, soft or hardened steels, plastics, glass and other material is contained in this booklet written by Arthur A. Schwartz, chief tool research engineer of the Bell Aircraft Corp. The booklet is available to TOOLING and PRODUCTION readers from the Tannewitz Works, Grand Rapids 2, Mich.
Circle Inform-A-Gram No. C4.

Cutting Oily Steel Plates can be hazardous because flames from the cutting torch often heat the oil deposits to the ignition temperature quickly, causing fires. One way to avoid such fires, say engineers of the Ansul Chemical Co., is to spread a thin layer of dry chemical over the area to be cut. By doing this, the flames are extinguished before they start and production remains uninterrupted.
Circle Inform-A-Gram No. C5.

Fixed Gages. Valuable information concerning fixed gages can be found in an illustrated booklet offered by the H. C. Clatfelter Co., 21810 Wyoming Ave., Oak Park 37, Mich. Included in the booklet is data on the care of gages, types of gages and the allocation of gage tolerances. The publication also introduces the reader to the H. C. Clatfelter Co., and relates the precision work the firm is doing, as well as listing standard products and their prices. For your copy write direct to the company or
Circle Inform-A-Gram No. C6.

GRINDING OILS

Suggestions for the beneficial handling of grinding oils is just one of many subjects covered in a 16-page booklet on grinding oils offered by D. A. Stuart Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.
Circle Inform-A-Gram No. C7.

What Are Thermistors? A new manual which enables a user to understand what Thermistors are, how they are applied, what functions they perform and what benefits industry derives from them in detecting and compensating temperatures, and providing time delay or surge control in electrical equipment, is available from Carboloy Dept., Detroit 32, Mich. Illustrations are keyed so a user can tell at a glance which type or style Thermistor is best adapted to his application.
Circle Inform-A-Gram No. C8.

Here is another "Desk Drawer Metallurgist" offered by the Crucible Steel Co. of America, Box 88, Pittsburgh 30, Pa. The reverse side of this chart contains a large number of important characteristics of stainless steel.
Circle No. C9.

. . . Crankpins, from page 68

Norton's new machine is built in sections, each base section supporting two grinding wheel heads which run on flat and vee ways. Each grinding wheel head carries a 42" diameter grinding wheel driven by its own motor. The wheel is mounted on a rugged spindle running in sleeve bearings — one bearing on each side of the wheel. Each base section supports two pairs of work heads which are driven by a single motor.

Wheel feed is operated hydraulically with a rapid motion by cylinder and piston which moves the complete unit. Actual feed for grinding the body of the crankpin is accomplished by a large diameter feed screw which is revolved in its nut.

The transfer mechanism consists of an overhead track which is supported by a fabricated steel framework and extending the whole length of the unit from loading to unloading conveyor stations. The transfer heads travel vertically to pick up and deposit the crankshafts at each station, moving simultaneously. When moving horizontally to transfer the work between stations, all heads move in unison (they are actually joined together). Cranks in process are all picked up at the same time and moved one station to the right for grinding of succeeding pins or placing in the conveyor station for transfer to the next type of operation. While the actual grinding is being done, the heads return to pick-up.

Movements of the transfer equipment are operated hydraulically with electrical interlocks to insure proper sequence and to stop the whole procedure should any part of the transfer or grinding equipment fail. Movements are timed and controlled to stop and start without noise or jar and to travel rapidly between stations.

Grinding time for a complete crankshaft, including all the crankpin journals and adjacent shoulders is comparable to that of a good operator working at top speed on a modern conventional type of crankpin grinder grinding a single crankpin. Being completely automatic, the machine operates at close to 100% efficiency all the working day. The machine can be preset to operate at a definite rate of production continuously.

Should it be necessary to shut down any station for adjustment or repairs, the unit can be controlled to operate in such a way as to by-pass the inoperative station. A stand-by conventional crankpin grinder can be used to grind the crankpin skipped by the automatic unit in this event. If the transfer equipment should fail, the individual grinding stations can be manned by operators and production resumed.

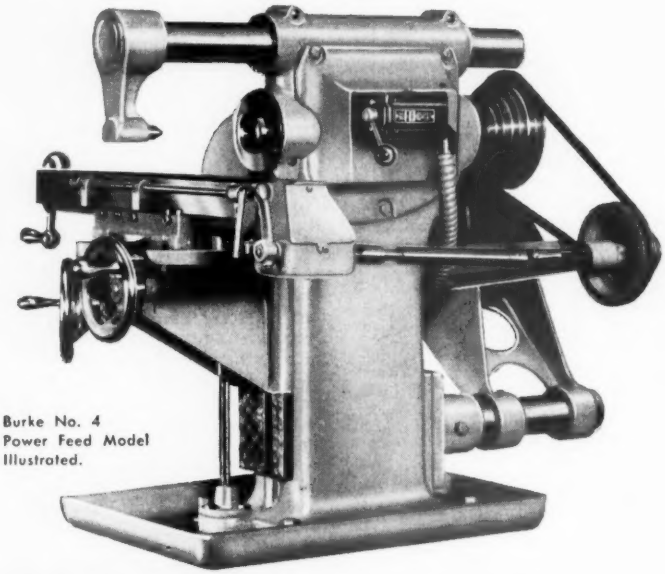
It has been estimated that this automated crankpin grinder will allow one man to do the work of five to seven men using conventional semi-automatic grinding machines. On the face of it, this would seem to mean that several operators would be pushed out of jobs. In practice, however, these men are usually absorbed into other jobs where their skills can be used to good advantage.

This is Norton's latest development in the field of automatic grinding. Through feed lapping on a Norton No. 2 HYPROLAP high production lapping machine

IT'S AMAZING

what these little rascals can do!

That's why Burke Bench Millers are a big favorite in thousands of tool, school, development, repair and mass production shops.



Burke No. 4 Power Feed Model Illustrated.

BURKE Bench Millers

— are so rugged, accurate and versatile they can practically reproduce themselves!

Send for complete data on models, specifications and full line of attachments.

THE U. S. BURKE MACHINE TOOL DIV.

Brotherton Road 7, Cincinnati 27, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 100

was the first application of automation. Norton's piston grinder can be equipped for automatic work handling.

Robert D. Lawson, sales manager of Norton's Grinding Machine Division says, "In the light of our experience with these machines, Norton Company is prepared to consider the automation of any grinding job."

Automation will never replace all the grinding operations now performed manually. The initial expense of automatic handling equipment and the space consumed must be offset by the savings which can be made by the reduction in the labor force.

Everett M. Hicks, Norton vice president and manager of the Grinding Machine Division, in addressing the Annual Meeting of the American Society of Mechanical Engineers last December discussed automation. He said, "In looking for operations which are likely to pay off (by using automation), chances are best on those operations which have high labor costs. The stability of product design should be considered, and the proposed automatic equipment should be studied to see whether it can be readily converted for minor design changes in the product.

"The complete processing of the part must be reviewed and in many cases minor changes in design will be needed to facilitate the automatic handling."

In summing up his talk, Mr. Hicks stated that these are some of the questions which must be asked when considering automation or other modernization.

1. Have we selected the job which promises the greatest possibility of savings?
2. Is the job one with a relatively high labor cost?
3. What is the situation as to product design stability?
4. Has the proposed equipment been studied for ease of maintenance and change-over flexibility for design changes when they occur?
5. Have we skilled mechanical staff required to maintain automatic equipment or can it be obtained readily?
6. Has labor acceptance of the proposed equipment been determined?
7. Has down time for tool maintenance been given sufficient consideration?
8. And above all — will it pay?

. . . Thermoplastics, from page 87

with full diameter runner approaches ending in a hemisphere at the gate land.

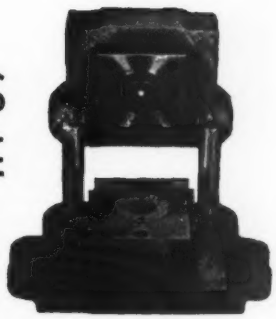
The higher bulk factor (3.9) of Fibertuf 1 and Fibertuf X makes the volume capacity of the feed mechanisms the limiting factor on the weight of pieces which can be made. It is essential that the weight of the shot be kept at or below the rated capacity of the machine.

Mold Abrasion

One difference in the injection process as practiced with this premix is that, while the presence of the polystyrene in Fibertuf permits the use of the material without serious erosion of the cylinder or mold, there is a tendency for the glass fibers in the premix to abrade the cylinder and mold walls to a greater degree than with standard polystyrene. It is therefore suggested that all molds be chrome plated. The higher the polystyrene content, the less is the tendency for abrasion of the mold or nozzle.

"A MUST wherever WASHERS are made!"

HOVIS OFFERS YOU THIS SIMPLE, UP-TO-THE MINUTE METHOD



There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.

Made in 5 sizes:

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CIRCLE INFORM-A-GRAM KEY NO. 101

MEN YOU SHOULD KNOW . . . .

C. Allen Hurt

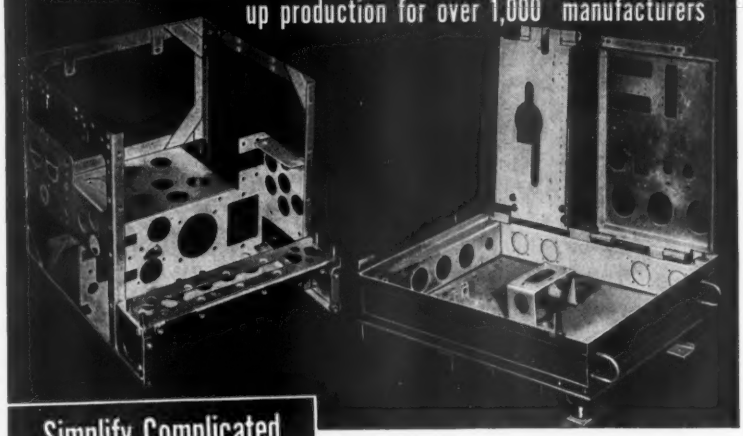
C. Paul Porterfield

Edwin Y. Bready

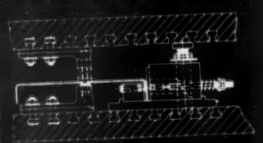
Charles A. Thomas, Jr.

James L. MacDowell

Whistler Adjustable and Magnetic Perforating Dies are stepping up production for over 1,000 manufacturers



Simplify Complicated Piercing Operations



Use this HU-50 90° Perforating Unit on the same job with other Whistler Dies . . . often saves extra press operations.

USE WHISTLER Adjustable and Magnetic Dies for perforating, notching and slotting sheet metals . . . fast, accurate and cost cutting. Complicated patterns can be set up quickly. Hole arrangements can be changed in the press . . . without waiting and at no extra die cost. New HU-50 units, that pierce at 90° angle, can be used in conjunction with standard perforating equipment. Fewer press operations are necessary.

Re-use the same dies in different arrangements on many jobs. Punches and dies are interchangeable.

Whistler Adjustable Dies can be used in practically every type press. Standard sizes and shapes of punches and dies available up to 3 inches. Special sizes and shapes to order.

S. B. WHISTLER & SONS, Inc.

748 Military Road

Buffalo 23, New York

For prices and application data on this modern way to speed production and cut unit costs, write for these illustrated Whistler catalogs.

For your convenience **Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.**

CIRCLE INFORM-A-GRAM KEY NO. 102

C. Allen Hurt has joined TOOLING and PRODUCTION, the Magazine of Manufacturing Management as Sales Manager, it was announced by George J. Huebner, president of Huebner Publications, Inc., and publisher of the trade journal. Hurt joins the advertising sales force of the magazine after 18 years in the industrial sales and sales management field in the East, South and Midwest with Eastern Stainless Steel Corp. of Baltimore, Md., Federal Telephone and Radio Corp., Newark, N. J., Osco Steel Co., Cleveland, Ohio and more recently, the Solar Steel Corp. of Cleveland.

◆

The election of **C. Paul Porterfield** as vice president and general manager of the Method X Co., an affiliate of Firth Sterling, Inc., Pittsburgh, has been announced. Porterfield has had extensive experience in the field of electronics having served as electronic engineer for the Chesapeake & Ohio Railroad, chief engineer of Air Transport Maintenance Co., and radio engineer in the 7th Naval District in Miami. Previous to his recent appointment, he was chief engineer at Method X.

◆

Standard Pressed Steel Co., Jenkintown, Pa., has moved up **Edwin Y. Bready, Charles A. Thomas, Jr.,** and **James L. MacDowell** in the ranks of top management. Formerly director of purchase, Bready has been made division manager of the Hallowell Pressed Steel Division. Thomas, manager of industrial relations and industrial engineering, has been given company-wide charge of production control, quality control, estimating and cost analysis in addition to his previous responsibilities. MacDowell has been advanced from manager of tooling and quality to superintendent of manufacturing, Fastener Division, in charge of engineering, the tool room, metallurgy, automatics, forging, heat treating, plating and finish.

. . . . MEN YOU SHOULD KNOW

Harold E. Martin

Sam Morrison

Harold A. Daschner

W. B. Duncan

E. Mortensen

Harold E. Martin has been named division superintendent of a newly created Metal Cutting Division of the Brown & Sharpe Mfg. Co. In his new position, Martin will have full charge of the present cutter manufacturing, hardening and engineering departments, as well as the cutter office.

◆

The Board of Directors of the Pressed Metal Institute (national association of the metal stamping industry) has elected **Sam Morrison** second vice president of the Institute. Morrison is president of Morrison Steel Products, Inc. of Buffalo, N. Y. Officials of PMI also announced the appointment of **Harold A. Daschner** of East Lansing, Mich., as assistant manager of the Institute.

◆

Wesson Company of Detroit, manufacturer of carbide cutting tools, announced the appointment of **W. B. Duncan** as chairman of the Board of Directors. Also reported was the selection of **E. Mortensen** as president of Wesson Tool Co. Duncan had been president of Wesson Tool Co. since 1941. Previous to that he had been associated with the Latrobe Tool Co., and the Chicago Latrobe Twist Drill Co. Mortensen, previous to his elevation, served Wesson Tool Co., as vice president in charge of manufacturing.

◆

Dan D. Felske has been appointed vice president in charge of sales over all divisions of the Gear Grinding Machine Co. His new duties will include the coordination of the sales efforts of the firm's grinding service and Geargrind machine divisions, as well as the Rzeppa universal joint division which he headed in the past.

◆

Edward J. Pratt has been elected first vice president and John S. Gorski second vice president by the board of directors of Amco Gage Co.

DICKERMAN LEADS AGAIN . . .

with the NEWEST DEVELOPMENT in . . .

Hitch Feeds!

New 2½" Model K Hitch Feed

FIRST

NO OTHER FEED — AT ANY PRICE — OFFERS ALL THESE PRODUCTION INCREASING ADVANTAGES!

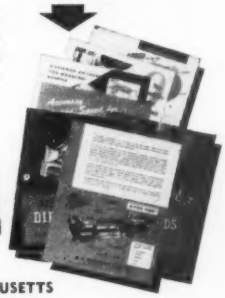
NEW MEEHANITE CASTINGS
Massive frame of virtually indestructible meehanite makes the new Model K the strongest hitch feed ever built.

LONGER FEED LENGTH
Extra frame strength allows full 2½" feed length on stock up to 5" in width.

CARBIDE GRIPPER PLATES
Carbide gripper and wear plates are standard on this new, rugged, versatile feed.

Send for LITERATURE and CATALOGS on the complete line of Dickerman MONEY-MAKING FEEDS.

A great, new addition to the Dependable Dickerman line — a feed that will outlast almost any die — trouble free, accurate — day in — day out operation speeds production and actually cuts parts cost up to 60%.



Dickerman

H. E. DICKERMAN MFG. CO.
324 - 226 ALBANY STREET SPRINGFIELD, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 103

REINFORCED PLATSIC TOOLING FOR AUTOMOTIVE BODY WORK*

by Fred Lyijynen
Supervisor
Experimental Plastics Division
BRIGGS MANUFACTURING CO.
Detroit, Michigan

SEVERAL TYPES of plastic dies — draw dies, form dies, flanging dies and others — have been produced by Briggs, and engineers find that each requires a different approach in order to obtain the desired results. To explain generally the process for developing these dies, we have selected as an example one of the most common types — the draw die. The process is a combination of hand layup and low pressure casting.

In the manufacture of draw dies, it is practicable to work directly from models or from prototype panels. Assuming that we are to build a die to a wood model, we can, as required, add and open flanges on the model, establish ring lines and the like, and then cast our die directly against the model. The model to be used must first be boxed in so that the face of the model forms the base of the box. All surfaces must then be coated with a parting agent, such as wax, aluminum foil, etc. The face of the die may now be laid up, using Fiberglas roving or Fiberglas cloth, saturated 50% with polyester resin. The polyester resin to be used for the entire die is all mixed at the same time, using cobalt naphthenate and MEK peroxide as the curing agents.

We have found that the proper choice and positioning of parallel strands and cloth is essential to draw die life. In drawing soft metal, such as aluminum, the die face must be made entirely of glass rovings to eliminate any cloth pattern from being embossed on the metal. The roving is saturated by pulling it through a dip pan and then through a bushing to doctor off all resin in excess of 50%. The saturated roving is cut off in lengths to fit the inside of the box where it is laid, side by side, until the face of the die model is covered.

In making a face with glass cloth, the cloth is cut into patches of an appropriate size for easy pre-saturation and lay-up on the die model face. The usual procedure is to roll the rovings or cloth, as the case may be, in order to insure that there is absolutely no air on the face of the die and that there are no resin-rich pockets, which would contribute to excessive die wear. The box is then filled with chopped fibers, pre-saturated 50-% with resin.

The saturated fibers are prepared by placing 2" lengths of chopped fibrous glass in an impregnating box. A quantity of resin, weighing approximately

*Condensation of paper presented at the Ninth Annual Technical Conference of the Reinforced Plastics Division, Society of the Plastics Industry, and reprinted here through courtesy of SPI.

Changes from one tool to another is a matter of seconds. Three point locking feature and tapered shank assures repositioning and eliminates "run out." Send for catalog describing individual holders and adapters or for specific information on your machine tools.

PORTAGE Double-Quick TOOL CO.
1046 Sweitzer Avenue • Akron 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 104

the same as the chopped strands, is poured over the strands. A perforated cover is then placed on the top of the resin-glass mixture and the entire impregnating unit is placed in an air press, where pressure from 10 to 20 psi is gradually applied, forcing the resin into the voids within the fibrous glass.

Pressure is maintained until resin issues from all the perforations in the top plate, indicating thorough impregnation of the material. The impregnating box is then taken out of the press and the mixture is removed from the tank and loaded on top of the facing in the mold box.

The entire lay-up is now covered with a wooden plug, tailored to fit the box, and placed in a press to be squeezed at approximately 20 psi until the resin cures. Through the use of pressure while the dies are going through the gel stage, shrinkage can be controlled and the die can be cast true to form.

After one section is made up, the successive sections are cast to it. Wherever metal thickness is required, a prototype panel of the desired dimensions can be made from glass cloth and polyester or epoxy resin. Sheet lead also may be used for this purpose.

In cases where extreme conditions of wear are encountered, such as extreme sharp corners or deep draws, metal inserts are pre-fitted to the model and cast into the die face. After the die is completed, metal also may be added in repairing a section showing excessive wear.

When all sections of the die are completed, they are placed in a 200°F oven for 24 to 72 hours, depending on the die size.

Plastic Fixtures

In the process of tooling up for our last style change, a series of reinforced plastic fixtures were submitted and tried out in actual production. Their durability and accuracy were maintained, even after the rough handling required by high production methods. In many cases, production was increased due to the compact construction and lighter weight made possible by use of one-piece reinforced plastic fixtures.

The cost of reinforced plastic tooling in most cases is only a fraction of the cost of equal tooling made of steel, and the speed with which reinforced plastic fixtures can be produced has assured us of quite an extensive program in the forthcoming style change.

The tests to which these plastic fixtures have been submitted have shown that no single type of construction does satisfactory work for all jobs.

With a common drill and locating fixture to be used in high production, a high glass content is necessary to hold hardened steel drill bushings and dowels and also to withstand the terrific abuse of high production.

It can readily be seen that achieving this high glass content requires more than a wet lay-up. Successive layers of dense Fiberglas cloth can be used, but material cost is thereby increased to a degree where it becomes excessive. Fiberglas in "mat" form is much more economical.

Fixtures differ from dies in

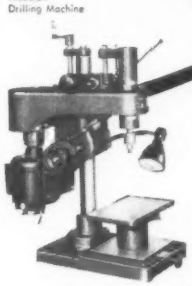
. . . *Continued on page 109*

5408

precision product?

EXACT HOLES ARE IMPERATIVE!

HAMILTON VARIMATIC®
Super Sensitive
Variable Speed
Small Hole
Precision
Drilling Machine



Are you fighting the never-ending battle of trying to produce exact holes on a drilling machine which, itself, is not built to precision tolerances? You are under no necessity to do so. For the difference in price between the cheapest bench type, small hole drilling machine and the Hamilton Varimatic is reckoned in pennies per day. And the Hamilton Varimatic (holes from .004" to 5/16" in all drillable materials) is *super sensitive*. Provides speeds, *infinitely variable*, between 840 R.P.M. and 9300 R.P.M. Is built to *precision tolerances*, and with the stamina to *retain* precision.

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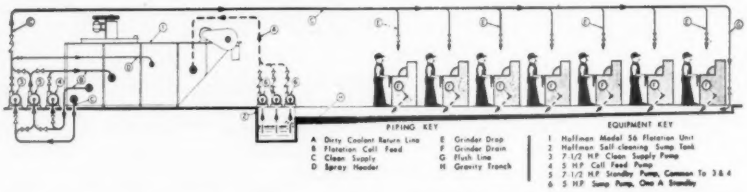
CIRCLE INFORM-A-GRAM KEY NO. 103

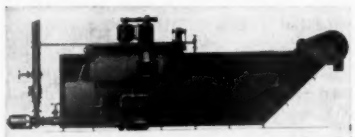
Filtration Saves $ on Grinding Operations


PIPING KEY
A Dirty Coolant Return Line
B Flotation Cell Feed
C Clean Supply
D Spray Header
E Grinder Drop
F Grinder Drain
G Flush Line
H Gravity Trench
EQUIPMENT KEY
1 Hoffman Model 56 Flotation Unit
2 Hoffman Self-cleaning Sump Tank
3 7 1/2 H.P. Clean Supply Pump
4 5 H.P. Cell Feed Pump
5 7 1/2 H.P. Standby Pump, Common To 3 & 4
6 5 H.P. Sump Pump, One A Standby

A schematic of the central filtration system which has effected savings for the General Railway Signal Company all the way from the amount of coolant used, to a 50% reduction in wheel dressings, and elimination of the maintenance of 19 individual grinder sump pumps.

The maintenance necessary in connection with varied grinding operations on parts for signal systems was costing the General Railway Signal Company a sizable sum of money. Cleaning the grinding machine sumps cost $3800 yearly for labor, while maintenance of the sump pumps also required a considerable annual outlay. In addition, $1152 a year had to be spent on coolants for the grinding operations, and losses in raw materials through rejects due to poor finish were excessive. These conditions finally made it apparent that coolant filtration equipment should be installed. After this was done no labor had to be diverted to cleaning grinder sumps, coolant costs were reduced to $600 a year, maintenance on the sump pumps was eliminated, and rejects were held to a minimum.

The General Railway Signal Company of Rochester, N. Y., manufactures signal systems and appliances to protect and facili-



The flotation unit is the heart of the centralized filtration system.

tate train operations. All such equipment is designed to "fail safe", which means that failure of any part of the system brings traffic to a halt rather than allowing it to proceed into possible danger. Even so, all equipment is designed to operate with the highest possible degree of reliability, since unnecessary stopping of trains would place an added burden of expense on the railroads in fuel consumed, man-hours wasted, and passengers and freight delayed.

Much of this equipment must operate automatically, day and night, under all sorts of weather conditions. The reliability of the equipment is assured by careful manufacturing methods. Standards of production are maintained on a high level. Parts making up the numerous assemblies and units must fit accurately. Therefore, precision machining of the parts is specified by the engineers to insure perfect functioning of equipment.

MID-WEST
Tool grinding wheels

IT'S A FACT!
Tool Room Wheels made with Mid-West's exclusive S11A grit (developed and produced in Mid-West's own Abrasive Grain Plant) more than likely can perform your tough tool grinding operations more efficiently and more economically. Yet, S11A is not a premium priced abrasive grain.

A FACT THAT CAN BE PROVED!
For in the tool rooms of Mid-West customers all over the country, S11A wheels, combined with Mid-West's exclusive vitrified bonds have been tested time and time again with these results: *Operating costs were cut, while grinding efficiency increased!*

Check with your nearest Mid-West representative today for detailed information related to your particular operation, or, write direct to:

MID-WEST ABRASIVE CO.
EXECUTIVE OFFICES:
510 S. WASHINGTON ST., OWOSSO, MICHIGAN
PLANTS:
OWOSSO, MICHIGAN AND
ROCHESTER, PENNSYLVANIA

MID-WEST QUALITY ABRASIVES

CIRCLE INFORM-A-GRAM KEY NO. 106

Before a continuous filtration system was installed the oil used as a coolant in the grinding operations became highly contaminated in a short time. The continued use of this oil over a period of a week caused the contaminating metal particles to become imbedded in the surface of the grinding wheel which impaired product finish and necessitated frequent wheel dressings. Not only was production slowed, but all individual grinder sumps had to be cleaned each week and 2200 gallons of oil discarded.

After a thorough study of known methods and equipment available for coolant purification, management decided to install a central filtration system for coolant restoration. A Hoffman Flotation Clarifier was chosen as the oil filtration unit and around this the central system was designed.

When the system was set up the benefits of filtration became evident immediately. Clean oil was delivered to the grinders continuously and wheel dressings were reduced 50%, thereby doubling grinding wheel life. The coolant was no longer discarded each week. Oil replacement took place only once in eight months reducing coolant cost to $600 a year. With filtration, machine sumps no longer had to be cleaned at all, saving $3800 annually. Another important benefit was that with clean oil being delivered constantly there were no more metal particles to interfere with grinding operations or to impair the product finish. The result of all these other improvements was that rejects were reduced to a minimum, saving thousands of dollars yearly. Finally, with the filtration system it was no longer necessary to furnish maintenance for the 19 individual grinder sump pumps since they were discontinued.

The equipment used in these grinding operations consists of Heald Internal Grinders, Thompson Grinders, Landis External Grinders, Norton External Grinders, Majestic Internal Grinders, Gallmeyer-Livingston Grinders, Blanchard Surface Grinders, and Cincinnati Centerless Grinders. The oil clarification unit of this fully automatic filtration system is a Hoffman Model 56 flotation unit with a flow rate of 300 gallons per minute. Other equipment consists of necessary motor pumps, overhead clean coolant supply lines to the grinders, and floor trenches for gravity drainage of dirty coolant to the self-cleaning sump tank located beneath the floor.

The filtration cycle begins as the dirty oil leaves the grinders and flows down the drainage trench to the dirty coolant sump tank which is constructed with a baffle in the rear to maintain constant agitation. This is done by the force of the oil flow and is necessary to prevent settlement of particles. Next the oil is transferred by two motor pumps from the sub-floor sump tank to the Hoffman flotation unit. A spare pump, located in the sump tank, acts as a standby and is operated by a float and cut-in switch. This prevents possible overflow. If the dirty coolant rises too far the float trips the extra pump switch and the excess oil is pumped out. In reverse, if the coolant level drops too far for proper operation the float trips another switch and

. . . *Continued on page 108*

5410

NOW CUT COST OF PRECISION GEAR PRODUCTION

THIS FEATURE: "*Independent* selection of speed, feed and indexing," sets the Hamilton Precision Small Gear Hobber apart from the field,

AND ENABLES the users of this machine to vary speed and feed to suit the material being machined.

THIS FACT, and a "reserve of accuracy" built into the machine, work spindle and hob spindle runout of less than .0002" as an example,

CONTRIBUTES to more gear precision with no sacrifice of gear production,

OR INCREASED gear production with no sacrifice of gear precision,
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CIRCLE INFORM-A-GRAM KEY NO. 107

. . . Filtration, from page 107

the pumps are stopped until the desired operating level is restored. In the Hoffman unit there is another tank for settlement of the heavier contaminant particles before the coolant is pumped into the flotation cell. In the flotation cell a rotor-stator assembly produces a dispersion of bubbles which entrains the insolubles. This froth is removed by a pair of skimmers driven by a separate motor through a speed reducing unit and dropped back into the dirty coolant section where a spray assists in the settling out process. An automatic drag chain conveyor, mounted with a series of scraper flights and driven at slow speeds to permit maximum oil drainage, drags the sludge up an incline and dumps it in a removal cart. Clean oil flows at all times from the flotation cell into the clean oil section of the tank where it is pumped out through overhead pipelines to the grinders, clarified and ready for re-use.

Nearly all industrial fluids — oils for coolants, grinding and cutting, running-in, honing and lapping, circuit breakers and transformers, diesel and fuel oils, and rolling mills, parts washing solvents and industrial waters — can be restored again and again. The savings realized through filtration usually pay for the equipment in a short time.

A number of mechanical principles, either individually or in combination, are employed to remove the various impurities, chips, turnings, rust, dust, dirt, lint, abrasive grits, water, entrained air, carbon and fuel dilutions, or oil oxidation products such as resins, gums, organic acids, and asphaltenes.

Removal methods include flotation, gravity settling, filtering through various types of materials, vaporization, vacuum distillation, pressure filtration and magnetic separation. U. S. Hoffman equipment utilizing these principles has been designed in a complete range of models to serve the many specific needs of industry. This apparatus may consist of a single compact unit attached to an individual machine, a mobile unit which moves from one machine to another, or a large central filtration plant handling fluids for an entire department.

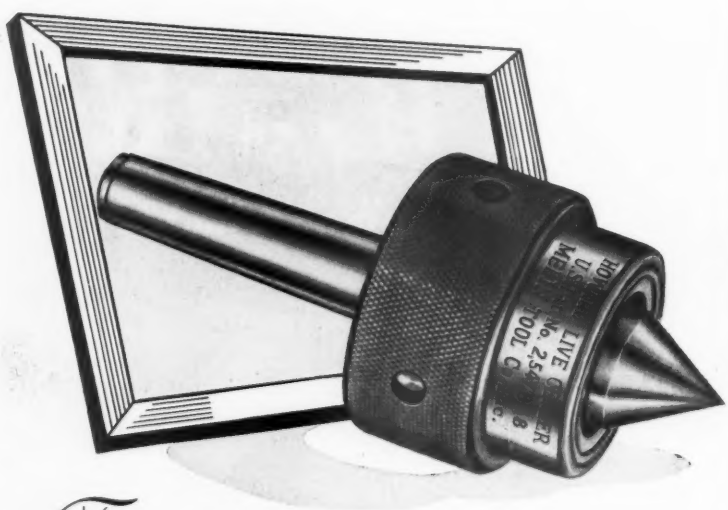
The main advantages of filtration are the conservation of the liquids themselves, and the reduction of downtime for production machinery. Other benefits are increased tool life, less tool loading, fewer rejects, better quality work, cleaner factory conditions, and a reduction in shipping, storage and disposal.

THREADING MOVIE

Jones & Lamson Machine Co., 160 Clinton St., Springfield, Vt., announces the completion of shooting on a new 30-minute threading film. In direct response to the reception given the thread tool section of its Production Seminars, J & L put the story on 16mm colored sound film.

Beginning with the basic definition of a screw thread, the movie shows both tangent and radial threading. Animation, demonstrations, and enlarged models inject plenty of interest.

This film will be available shortly on a loan basis, and Jones & Lamson is now ready to receive requests for booking.



Finest **LIVE CENTER MADE**

. . . HERE'S WHY

★ BACK UP RING assures positive rigidity.
★ Bar Expansion Eliminated by means of Thrust Spring.
★ Special alloy tool steel spindles, hardened and ground.
★ Matched precision ball bearings, mounted in tandem.
★ Oil impregnated bronze tail bearing.
★ Points pre-loaded and ground after assembly.
★ A distinctive oil seal in front of bearings protects them from all foreign matter. Chips, dirt and cutting oil cannot reach the bearings.

The HOWARD Live Center is the *ONLY* center that offers the patented *BACK UP RING*. The Ring maintains solid contact between the quill and head of the center . . . thus greatly increases over-all rigidity.

Send for the new MELIN TOOL Catalog No. 54-C . . . it lists, in addition to specifications and prices on the HOWARD Live Center, the complete MELIN TOOL End Mill Line.

MELIN TOOL CO. INC.

MELIN TOOL COMPANY, INC.
3371 West 140th St.
Cleveland 11, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 108

. . . Plastic Tooling, from page 105

that they are usually made outside of metal for assembly of metal parts. In most cases a die model is available to which the fixture is constructed for quality control.

The model, with reinforced plastic panel attached, is turned over to the pattern shop and the outline of the fixture itself is "framed" in wood strips to exact dimensions and contour required.

For the most part, we use a lay-up of glass mat, but to keep the mat from flowing, we insert 150's yarn forming cloth at intervals. This binds the mat and one layer of forming cloth is placed on the top and the bottom of the lay-up.

This is pre-saturated on a work table and with the use of steel rollers, the air trapped in the laminate is rolled out. The rolling, which is done over sheet P. V. A. film, also condenses the lay-up. It is then fitted to the framed model and sheet P. V. A. again is stretched over tightly and tacked down through tack strips. Small rollers are then used to give the entire set-up a final roll, which further condenses the lay-up and achieves the high glass content required.

A low exothermic polyester or a cool-setting epoxy resin is used. When cure is complete, the reinforced plastic panel is used to locate gage, pins, holes, or any other lay-out.

Usually, handles or stiffeners are made of reinforced plastic tubing and installed after assembly. Pressure plates likewise can be cast to achieve greater pressure, as required by some fixtures.

Plastic Models

The reaction to reinforced plastic models now in use by the Briggs Manufacturing Company is favorable and encouraging. Again, the lighter weight and the ability to withstand hard usage makes them desirable.

To date, our work with reinforced plastic models has been mostly with duplications. The cost of a duplicate in models is far offset by the time saved in tooling up when more than one model is available.

Let us assume a duplicate roof die model is to be constructed for use by the fixture division where "break-away" models are required. We find that higher skilled personnel are required to set up this model, as the manner in which this is done completely controls the accuracy of reproduction.

We find it necessary to have large surface plates and a sufficient number of various size angle plates and cubes for model work. No special equipment need be purchased, since regular tool shop equipment is all that is needed.

In our work with various types of reinforced plastic tooling, we find a knowledge of several types of resins, different processes and modifications of resins is required. Where a material does a good job in one case, it cannot be used to best advantage on another job. This creates a condition where experience and close cooperation with a technical force is essential. Personnel skilled in the tool industry and personnel skilled in the chemistry of plastics are prime requisites in successful reinforced plastic tooling.

5403
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WASTE MONEY
RISK ACCIDENT
doing things the
HARD WAY?
Take a trip through your plant today and note how many assembly and maintenance operations are being done in awkward or tiresome positions.
Imagine
THEM BEING DONE ON
PORTELVATOR
THE HANDY HAMILTON PORTABLE ELEVATING TABLE
With Portelvator hundreds of assembly and maintenance jobs are accomplished at the right height and in the best light. And that means money in the bank and workmen on the job, faster work and fewer accidents.
Portelvator prices start at $155.00—place a couple at your workmen's disposal and watch results.
Complete description in FREE Bulletin No. P-5403.
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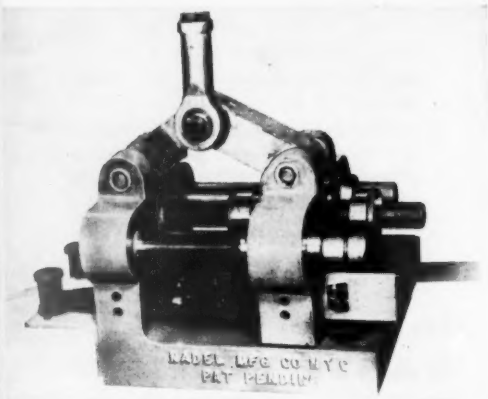
PROGRESS

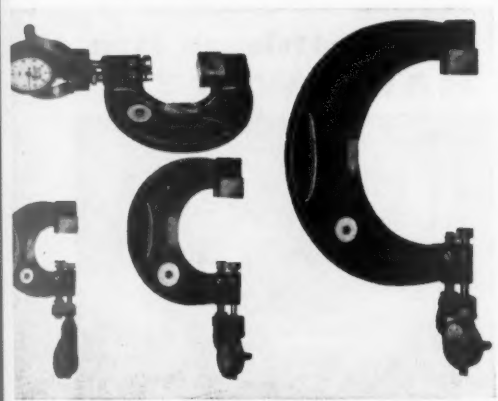
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



MICRO SLIDE FEED . . .

Errors caused by unequal action in locking strip material are eliminated with this micro slide feed developed for feeding stamping stock to an accuracy of "tenths". In a test run of 0.007 brass being fed unpiloted, variations did not exceed 0.0004". A circular on the slide feed is available from the Nedel Mfg. Co., 20 Warren St., New York 7, N. Y.

Inform-A-Gram No. A1.



CONVERTING GAGES . . .

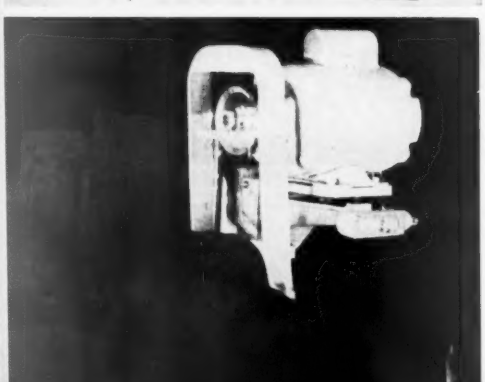
Dializers convert standard (AGD) adjustable limit snap gage frames to dial snap gages. They are available with a 1⅛", 1¾", or a 2¼" diameter indicator. In the photo, the Dializers are in snap gage frames and show indicator sizes newly available. These new instruments also include protective guards. For further information write to Standard Gage, Inc., Poughkeepsie, N. Y., or—

Inform-A-Gram No. A2.

DIAL COMPARATOR . . .

A new Universal dial comparator for quick and accurate reading of dimensions of very small parts such as used in the electrical, watchmaker, optician trades and in precision screw machines work has been put on the market by the Mercury Supply Co., 410 Fairview, Elmhurst, Ill. For full information write direct to the company, or—

Inform-A-Gram No. A3.



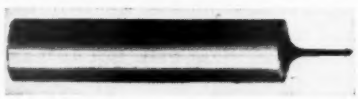
DEEP HOLE DRILLING. . .

This compact V-Belt deep hole drive unit with variable speed pulley can be mounted on #00 and #2 Automatic screw machines in a matter of minutes. Further data available from Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill.

Inform-A-Gram No. A4.

NEW BORING TOOL . . .

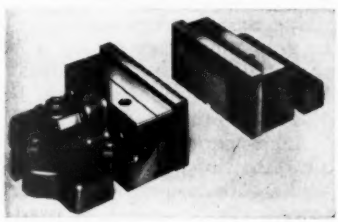
Short neck boring tools, designed especially to facilitate the boring of precision holes are now being produced by the Bokum



Tool Co., 14775 Wildemere, Detroit 38, Mich. The tools are available in both high speed and carbide tipped. For further information write direct to the Company, or— **Circle No. A5.**

MULTI-PURPOSE VISE . . .

This new two-piece REPCO vise set consists of two independent members and utilizes any "T" slot table as its base. The



vise capacity is limited only by the length of the machine table. Further data is available from the Rockford Engineered Products Co., Rockford, Ill.

Circle Inform-A-Gram No. A6

HEAVY DUTY JACK . . .

Here is a jack horizontal in shape and with a low overall height. This design provides stability in handling heavy loads

and permits the jack to be used in confined spaces. Full details may be obtained by writing to Lodding, Inc., Dept. N82, 79 Beacon St., Worcester 1, Mass., or—

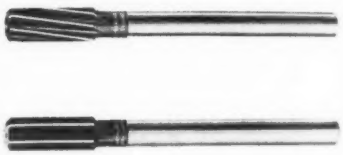
Circle Inform-A-Gram No. A7.

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

CHUCKING REAMERS . . .

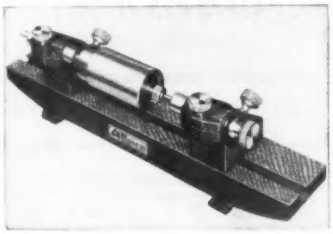
Now available as regulars in fractional sizes are Chicago-Latrobe chucking reamers. Write



to Chicago-Latrobe Twist Drill Co., 411 West Ontario St., Chicago 10, Ill., for complete description, sizes and specifications, or—
Circle Inform-A-Gram No. A8.

BENCH CENTER . . .

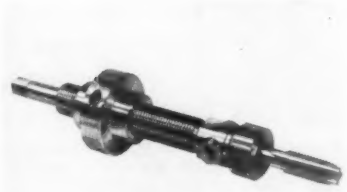
A new portable bench center weighing only 19½ lbs., with an overall length of 18" has been



developed by the Acme Industrial Co., 200 N. Laflin St., Chicago 7, Ill. Complete details and prices are available.
Circle Inform-A-Gram No. A 9.

TAPPING . . .

A drill press can be converted into a precision tapping machine when equipped with this lead



screw tapping attachment. Bulletin 101, available from Automatic Methods, Inc., 965 W. Grand St., Elizabeth 2, N. J., gives complete details. **A10.**

MICROMETER CONTROL

A micrometer control for the positive location of holes in the precision drilling of small units is a new feature on the super sensitive small hole drilling machines of the Hamilton Tool Co., Hamilton, Ohio. The control unit can locate one or a series of holes. Literature may be obtained by writing direct to the company, or—
Inform-A-Gram No. A11.

LIVE BUSHINGS . . .

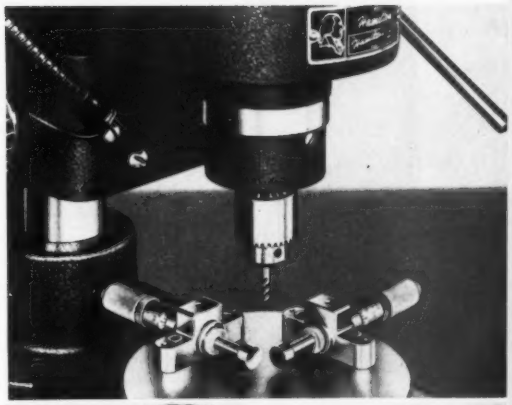
A new line of roller bearing live bushings for piloting applications on various sizes and makes of boring mills has been announced by the J. G. Jergens Co., 11106 Avon Ave., Cleveland, Ohio. The bushings permit the use of carbide tools to their full capacity for heavier cuts at higher speeds. For further information write to the company, or—
Inform-A-Gram No. A12.

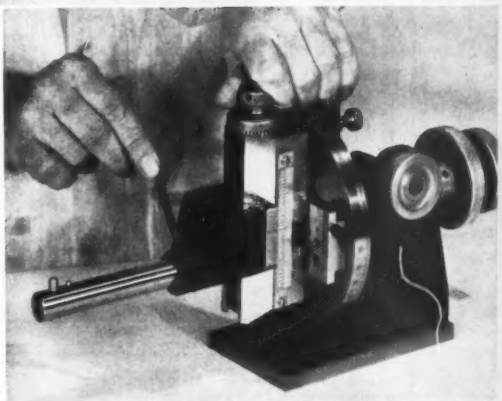
WHEEL DRESSER

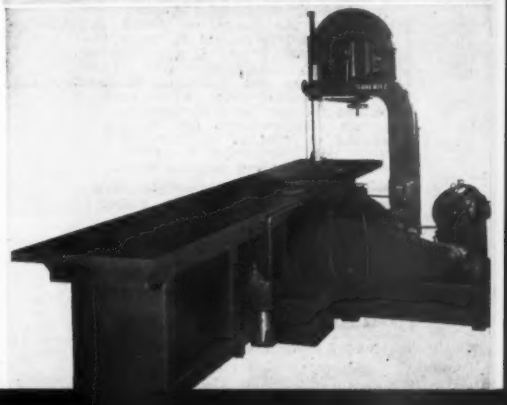
This redesigned grinding wheel dresser now incorporates a removable arm which permits the use of extension arms for dressing large diameter wheels. A built-in micrometer provides direct-reading, rapid adjustments and accuracy down to "tenths." Further data available from the Perfex Gage and Tool Co., 123 Avery St., Mt. Clemens, Mich.
Inform-A-Gram No. A13.

METAL CUTTING SAW

This unusual saw has a 19 ft. table and can be used for cutting 24" diameter cellulose acetate, steel and aluminum structural members and graphite blocks. More information can be had from The Tannewitz Works, Grand Rapids, Mich.
Inform-A-Gram No. A14.







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• Complete stocks
• All kinds . . . all sizes
• High speed steel
• Special taps for special needs
Call DoALL
see classified directory for nearest DoALL Service-Store carrying complete stocks cutting tools, gages, supplies.
Guaranteed
None Finer
The DoALL Co.
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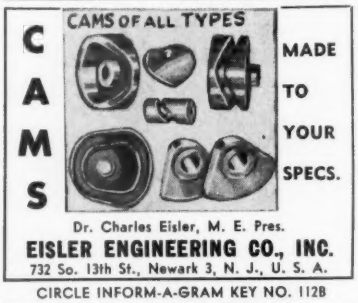
17

CIRCLE INFORM-A-GRAM KEY NO. 112A



CIRCLE INFORM-A-GRAM KEY NO. 112B

Drills, taps metal, wood, plastics. 2-minute setup on most drill presses; quick, accurate adjustment. Variety of models, ½" to 12⅝" centers.

The drill spindles are held rigidly in position when two nuts are tightened. Sturdily constructed. Suitable for adaptation to large or small drill presses. Models A and B made with sleeve. Models C and D with overarm adaptation, equipped with guide pins, springs and brackets, mounted to a cast-iron base with surfaces ground for use of drill fixtures. All models can be used for drilling or tapping on tapping machine or drill press with reversible spindle. Also used with standard tapping heads.

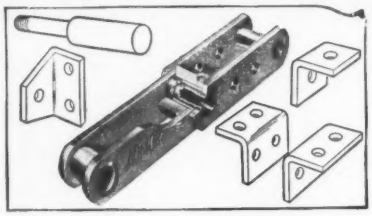
Multiple heads with fixed center distances are designed and built to meet your requirements. Available with GM Sleeves, Morse taper or drill chucks.

Write for full information

LINDERME ENGINEERING & SALES
8132 PURITAN DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 112C

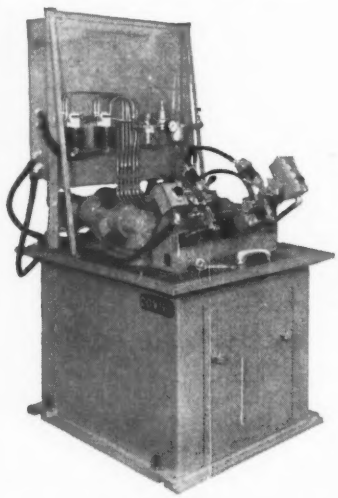
This New Conveyor Chain is ideally suited for construction of automation units. The fact almost any attachment the work may require can be added onto the chain makes



it unnecessary to order chain with special attachments. Literature and complete information is available from the Acmor Conveyor Chain Co., 17100 Miles Ave., Cleveland 28, Ohio.
Circle Inform-A-Gram No. A15.

Black Granite Straight Edges in lengths up to 72" have been added to the line of straight edges made by the Collins Microflat Co., 2326 E. 8th St., Los Angeles, Calif. Surfaces

of these new edges are finished to an accuracy of 0.002" per foot as against 50 millionths for super-precision surfaces. A bulletin describing the commercial accuracy straight edge is available.
Circle Inform-A-Gram No. A16.



A New Machine which drills right-hand and left-hand parts simultaneously has been announced by the Govro-Nelson Co., 1933 Anroinette, Detroit 8, Mich. Complete details are available.
Circle Inform-A-Gram No. A17.

FREE

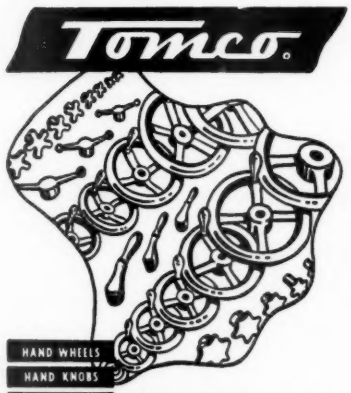
BOOKLET

The complete Quenzine quenching story . . . Low priced, more readily available carbon steels can often replace alloy steels when quenched in Beacon Quenching Oils with QUENZINE added. For information on this new additive write to . . .

ALDRIDGE INDUSTRIAL OILS, INC.

3401 West 140th Street
CLEVELAND 11, OHIO
Clearwater 1-3505

CIRCLE INFORM-A-GRAM KEY NO. 112D



Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

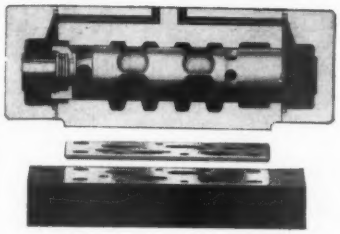
For original equipment or replacement parts look to Tomco for quality and service.

Write for literature

Tomco PRODUCTS CO.
1623 DOUGLAS AVE. RACINE, WISCONSIN

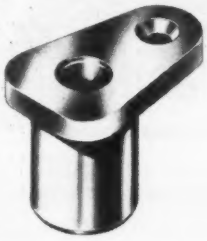
Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 112E



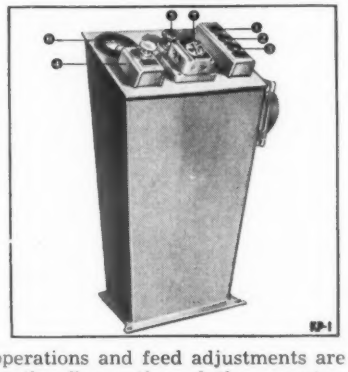
A Shock Resistant gasket mounted, solenoid operated 4-way valve has been developed by Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass. Write for Catalog 260, or—
Circle Inform-A-Gram No. A18.

This Router Guide Anchor Bushing is used in metal or laminate plastic router and drill templates. It offers such advantages as minimum edge distance and bushing height clear-



ance. Drill sizes that can be accommodated range from #40 through $\frac{3}{8}$". Pilot lengths of the bushings are 0.025" or 0.625". Write to The Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles, Calif., for further information.
Circle Inform-A-Gram No. A19.

A New and Improved Method of Operation for Its Larger Friction Saws is announced by Kling Bros. Engineering Works, 1320 N. Kostner Ave., Chicago, Ill. "Push Button" control is now available for these saws on a central control stand. All



operations and feed adjustments are at the finger tips of the operator. Location of the controls is as follows: 1—"Forward" Button. 2—"Reverse" Button. 3—"Stop" Button. 4—"Momentary Hold" Button. 5—Pressure Gauge. 7—Flow Control Valve. Further information available upon request.
Circle Inform-A-Gram No. A20.

P-S AIR SAVER leak proof AIR VALVE
50975 (Valve Alone) $13.20
50801 Complete Assembly Includes Valve, Mounting Rods, Operating Cam
$16.50
All prices are F.O.B. Detroit. Prices are subject to change without notice.
—For Maximum Machine Tool Efficiency—give you perfect, leak-proof air power control every split-second of machine tool operation. Ideally suited where air is used for cleaning, drying, cooling, positioning or ejecting. Recommended around punch presses, die casting machinery, drill presses, in reaming, broaching and many other operations. Provide ample air volume for operation of single or multiple jets. Mount in any position, to operate at any angle unaffected by vibration.
Immediate Delivery
½ INCH INLET
BRASS INLET BUSHING
STAINLESS STEEL VALVE SPRING
COPPER GASKET
STAINLESS STEEL VALVE SEAT
STAINLESS STEEL VALVE
½ INCH OUTLET ON BOTH SIDES
GRAPHITED BRONZE BUSHING
EXTRA LONG VALVE GUIDE
HARDENED STEEL ROLLER
REVERSIBLE OPERATING ARM
Item B-746 CORRUGATED BOX with legs
Item C-608 Automatic END DUMP
Item C-465 Vertical DRUM LIFTER
Item S-911 BARREL TRUCK loads automatically
Sloped Bottom BOX and STAND
Item B-748 Heavy Duty DIE TRUCK
SHOVEL TRUCK
Palmer-Shile Co.
16039 FULLERTON AVE., DETROIT 27, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 113A

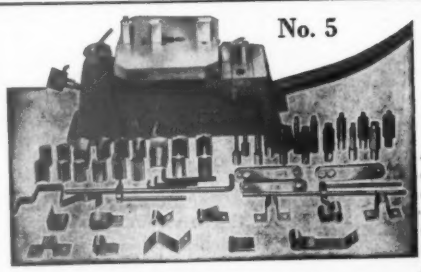
BUSHING BONDING CEMENT

For Retaining Drill Jig Bushings
Use B-K 7 # CEMENT

No distortion of the jig plate or misalignment of the hole pattern. Eliminates lapping of press fit bushings after assembly. Not affected by drilling heat. Bushings can be retained in steel, aluminum or fiberglas jigs. Easily applied by untrained personnel. Especially recommended for use in "master tooling" operations.

SHERIDAN PRODUCTS
1054 E. Hyde Park Blvd., Inglewood 3, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 113B



No. 5

Multiform
BENDER-CUTTER
CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to ⅛"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x 4" air operated.

ALSO AIR OPERATED MODELS.

WRITE FOR DESCRIPTIVE CIRCULAR

J. A. RICHARDS CO. KALAMAZOO, MICH.

You Can Cut Cost Per Hole with DoALL Reamers because:

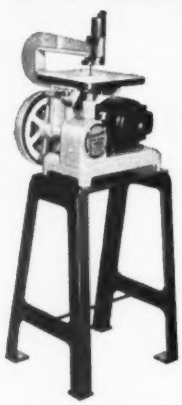
1. Special processing gives more holes per grind.
2. Faster feeds can be used.
3. DoALL stocks more sizes and types than anyone else.

Call DoALL—consult classified directory for nearest DoALL Service-Store that stocks cutting tools, gages, supplies—or Write

The DoALL Co.
Des Plaines, Ill. 18

CIRCLE INFORM-A-GRAM KEY NO. 114A

CUT TOOL AND DIE-MAKING COSTS WITH . . . Milwaukee DIE FILERS PROFILE GRINDERS



DIE FILERS

. . . for straight-line sharp corner filing, sawing and lapping

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

Write for illustrated Bulletins and Prices

PROFILE GRINDERS

. . . for high speed Precision Grinding of curved and Irregular Contours

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

RICE PUMP & MACHINE COMPANY

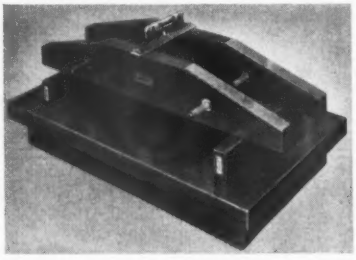
228 PARK AVENUE BELGIUM, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 114B

High-Speed, Air-Electric Gage. Through a combination of air gaging and electrical signalling, two OD's of a highly polished bearing are

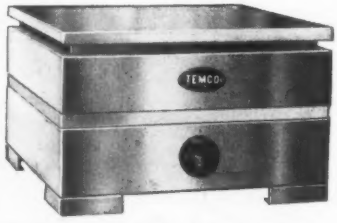
measured simultaneously by a new Air-Electric gage developed by Federal Products Corp., 1144 Eddy St., Providence, R. I. Details are available.
Circle Inform-A-Gram No. A21.

Parallel Straight Edges made of diabase (black granite) in matched pairs have been developed by Rahn Granite Surface Plate Co., 638 N. Western Ave., Dayton 7, Ohio. The photograph shows a pair, 36" long

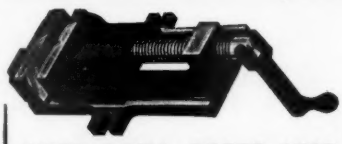


and 6" high. The top edges, 12" long, have been finished parallel to the 36" edges and both pieces are the same height within a tolerance of 0.00005". The 36" edges are also straight within 0.00005".
Circle Inform-A-Gram No. A22.

A New Electric Hot Plate has been added to the growing line of products made by the Thermo Electric Mfg. Co., Dubuque, Iowa. The new series serves for melting pitch, resins,



waxes, sealing of plastic wrappings, etc. In the laboratory it is used for boiling, extractions and routine heating. A leaflet available describes and illustrates the unique construction and temperature control method of the hot plate.
Circle Inform-A-Gram No. A23.



YOST DRILL PRESS VISE

● This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	25

Do you need a vise of ANY type? *Write today for bulletin on the extensive Yost line*

YOST MFG. COMPANY
1000 MAIN STREET
Meadville • Pennsylvania

CIRCLE INFORM-A-GRAM KEY NO. 114C

Specify DURANT

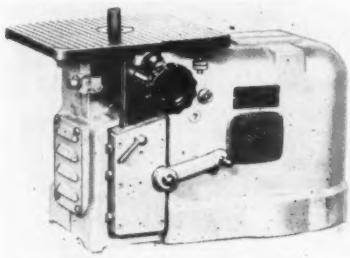
PRESS ROOM EQUIPMENT

Write Now
for new catalog showing prices and complete line of Equipment.

DURANT Tool Supply Co.
136 SOUTH WATER STREET, PROVIDENCE 3, R. I.

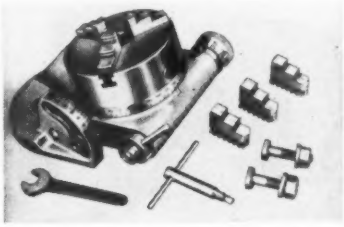
CIRCLE INFORM-A-GRAM KEY NO. 114D

Precision Built for Precision Work. This Milwaukee profile grinder is built to perform a wide variety of grinding operations. It is especially



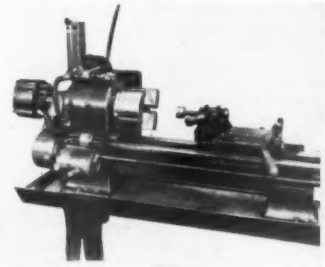
adapted to the precision grinding of die clearances and to the sharpening of cutter dies and punches. Literature available from the Rice Pump & Machine Co., Belgium, Wis.
Circle Inform-A-Gram No. A24.

A New Fully Adjustable Dividing Head that adjusts from a horizontal to a vertical position and rotates a full 360° has been announced by the H. P. Preis Engraving Machine Co., 282 Industrial Branch, Hillside, N. J.



The precision-graduated instrument has a fine adjustment in minutes for rotary micro setting and includes a three-jaw, three-step chuck for maximum adaptability. For further descriptive literature write direct to the manufacturer, or—
Circle Inform-A-Gram No. A25.

Tension Hydra Spring. This new Wales Tension Hydra Spring pulls rather than pushes to increase load and provides built-in snubbing action on return cycle. Capacity is to



7,000 lbs. and stroke up to 2⅞" maximum. For complete information write to the Hydra Spring Division, Wales-Strippit Corp., 345 Payne Ave., N. Tonawanda, N. Y., for Bulletin Hydra Spring.
Circle Inform-A-Gram No. A26.

Save Money!
Save Fingers!
SECOND FINGER $1,050.00
FIRST FINGER $1,200.00
THIRD FINGER $750.00
FOURTH FINGER $600.00
ENTIRE HAND $5,100.00
THUMB $2,100.00
Cost of Amputated Fingers
It pays to keep fingers out of presses!
AIR BLAST VALVES
Eject parts at each stroke of Press. PRICE $29.00
PRES-VAC SAFETY FEEDERS
Blanks are fed to a press from a safe distance of 14 inches. PRICE $35.00
Prices F.O.B. Plant
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Speed with Safety
AIR DIVISION
4197 RAVENSWOOD AVENUE
CHICAGO 13, ILLINOIS
District Offices: DETROIT and CLEVELAND
Write for FREE Catalog

CIRCLE INFORM-A-GRAM KEY NO. 115A

ENCO TINY TITAN TRADE MARK **NO. 100** *New Superior Magnetic Base Holder*

FOR MOUNTING TEST INDICATORS INSTANTLY TO FLAT OR DOWN TO ¾" ROUND WITH PULL OF 65 LBS.

Model 100 being used to align fixture in production mill.

- Every indicating problem now easily solved.
- No more indiscrimate clamping.
- All materials and workmanship unconditionally guaranteed.

NEW! 3-step universal rod for all indicators. Sizes ⅛", ¼" and ⅜" diameters.

NEW! Ball-swivel and stem of non-magnetic material.

NEW! Sure-grip non-breakable tenite plastic case 1⅛" wide, 1⅞" long and 1½" high.

NEW! Fool proof adaptor allowing 360° adjustment in all directions.

NEW! Magnetic pull 65 lbs.

PRICE $8.00 COMPLETE Attractively boxed.

SEND NOW FOR BULLETIN NO. 605 COVERING OTHER TINY-TITAN TOOLS

No. 120	Combination magnetic base indicator holder and magnifier, pull, 65 lbs	$12.50
No. 130	Precision adjustment magnetic base holder, pull 65 lbs.	$ 9.50
No. 150	Heavy duty duplex magnetic base holder, pull 125 lbs.	$15.50
No. 160	Precision adjustment heavy duty duplex magnetic base holder, pull, 125 lbs	$17.75
No. 200	Magnetic base "HANDI-LITE" pull, 65 lbs.	$ 8.50
No. 250	Heavy duty magnetic base lighting unit—holds 100 watt bulb, pull, 125 lbs.	$18.50

ENCO MANUFACTURING COMPANY, Dept. 754
4520-26 W. Fullerton Ave., CHICAGO 39, ILL.

Order from your Enco Stocking Dealer, or send order with name of your mill supply dealer.

CIRCLE INFORM-A-GRAM KEY NO. 115B

DoALL 2" Utility Monolight
. . . provides featherweight portability

- Checks surface flatness in millionths
- Ideal for use at production machines
- Perfect for roving inspectors
- Detachable head

HEAD SWIVELS 360°

Call DoALL — consult your classified phone directory for nearest DoALL Sales-ServiceStore stocking cutting tools, gages, supplies — or Write

DoALL OPTICAL FLATS
SQUARE ROUND
ALL SIZES

DoALL also has 5" and 20" Monolights

The DoALL Co.
Des Plaines, Ill. 29

CIRCLE INFORM-A-GRAM KEY NO. 116A

DOES IT BETTER
DOES IT FASTER

SIMPLEX-M
ABRASIVE BAND GRINDER

The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING WRITE TODAY

WALLS SALES CORP.
333 Nassau Avenue, Brooklyn 22, N. Y.

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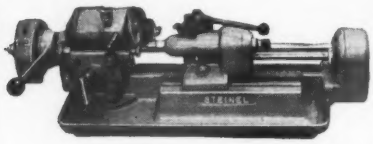
DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 116C

Steinel Pivot Burnishing Machines for the finishing of bearing surfaces on spindles, pivot shafts, drive journals, etc., to insure proper size and



improve surface quality have been introduced by the Morey Machinery Co., Inc., 383 Lafayette St., New York 3, N. Y. Complete details are available.
Circle Inform-A-Gram No. A27.

One-Inch Flexible Abrasive Belt Grinders with 10 1/2" throat depth have been put on the market by Hammond Machinery Builders, Inc.,

Kalamazoo, Mich. These new units can be used for deburring, grinding and polishing. Further information is available.
Circle Inform-A-Gram No. A28.

A New Series of Silicon Carbide Wheels for grinding tungsten carbide tools is now being produced by The Fuller Merriam Co., West Haven, Conn. Ingredients in the vitrified

bond combined with a distribution of the abrasive particles are calculated to penetrate and cut tungsten carbide with maximum efficiency. The company offers literature covering the new grinding wheels.
Circle Inform-A-Gram No. A29.

OLIVER
DIE MAKING MACHINES
Are BEST for
Your Toolroom

Because . . . their efficiency, speed and accuracy in machine sawing, filing and lapping save time and cut costs up to 60%. Simple to operate, OLIVER DIE MAKERS further reduce costs because they do not require expensive, hard-to-get skilled labor.

For nearly 40 years OLIVER DIE MAKING MACHINES have proved invaluable on such jobs as production Filing, Experimental Work, Metal Patterns, Cams, Gages, Templates, etc.

OLIVERS have proved their worth in over 10,000 installations throughout the world. Many of these superior, long-lasting Die Makers have been in continuous use for more than 25 years.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

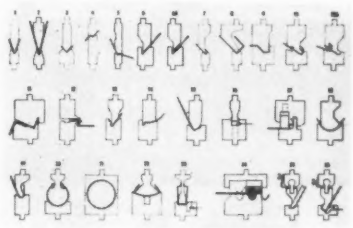
MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

See our catalog in Sweet's Directory

OLIVER INSTRUMENT CO.
1436 E. MAUMEE · ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 116D

26 Standard Styles of Brake Dies. As a guide for selection of the proper types of brake dies for bending and forming sheets of steel and

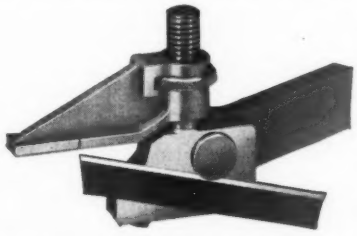


other metals, a chart of 26 standard styles is now available from Service Machine Co., Inc., 506 Miller St., Elizabeth, N. J. A copy of literature and the chart will be sent to anyone requesting it.
Circle Inform-A-Gram No. A30.

Fluted Set Screws stay easier and more positively on the wrench or key while inserting or starting in a tapped hole. They have been added

to the complete range of Setko set screws. Detailed literature can be obtained by writing the Set Screw & Mfg. Co., 158 Main St., Bartlett, Ill., or—
Circle Inform-A-Gram No. A31.

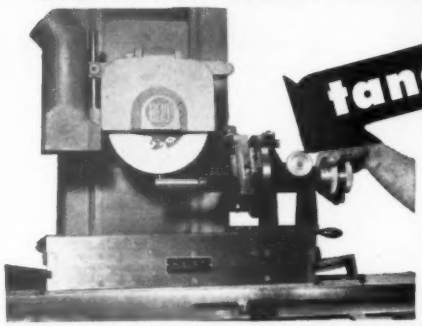
A New Type of Tool Holder which by means of a steady-rest holds the work down, overcomes the tendency of the stock to lift, climb on the tool, break it and ruin the work. Chatter



and digging into the stock also are eliminated with this holder. Complete data on the product will happily be furnished by the Novi Tool & Machine Co., 25806 Novi Rd., Novi, Mich.
Circle Inform-A-Gram No. A32.

You dress better for less with

tangi-matic



RECOMMENDED BY LEADING MANUFACTURERS OF SURFACE GRINDING EQUIPMENT

Reid Bros. Surface Grinder dressing with a Perfex TANGI-MATIC

Now you can dress angles tangent to radii within "tenths" and set-up in one-fourth the time with the new TANGI-MATIC Dresser. A *built-in*, direct-reading micrometer eliminates "mikes", height gages, Jo Blocks and errors—and saves you time. Even novice operators obtain extreme accuracy.

TANGI-MATIC dresses any concave radius down to .032", full 180°. Set-up can be made without removing dresser from your grinder chuck. A removable dressing arm permits the use of extensions for large wheel dressing.

Wearing surfaces are hardened, ground and lapped for assurance of years of extra service over ordinary dressers. Lead screw is hardened and ground to extreme tolerances.

TANGI-MATIC is furnished complete with master setting block, small radius attachment, plastic hood and carrying case.

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ACCURACY PERFEX OUR CREED **PERFEX GAGE & TOOL CO.**

120 Avery St. • Mt. Clemens, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 117A

HARDENED and GROUND HSS BLANKS

Any decimal diameter to ½"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

Write or Phone ORange 3-4301 for price list D-3

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STOP DUSTS INSTANTLY

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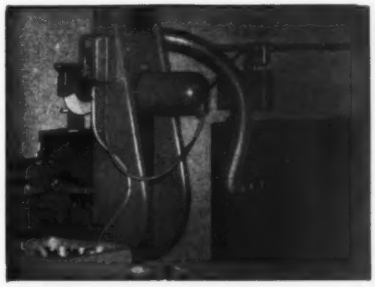
DUSTKOP

Available from stock of 22 standard models.

300 cfm to 10,000 cfm

Ask for Catalog 605-2. Describe dust problem for recommendation by return mail—No Obligations.



AGET-DETROIT CO.

213 Main St., Ann Arbor, Michigan

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STOP PRODUCTION ERRORS
with NEW Bausch & Lomb
OPTICAL COMPARATOR

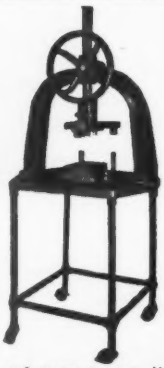
• Sold Exclusively by DoALL
• Finest, Lowest Priced, Quality Unit of its Kind
• Get the Facts

Call DoALL — consult classified phone directory for DoALL Service-Store that stocks gages, cutting tools, supplies, — or Write

The DoALL Co.
Des Plaines, Ill. 34

Checks to "tenths"
Anyone can operate it
Can be used without fixtures

CIRCLE INFORM-A-GRAM KEY NO. 118A



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Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the diemaker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

Sole Distributors
MOORE SPECIAL TOOL CO., INC.
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LAY-OUT AND IDENTIFICATION DYE

7 COLORS

For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheets, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

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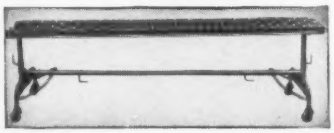
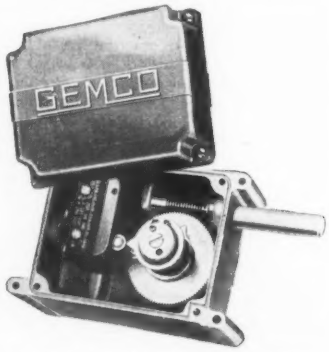


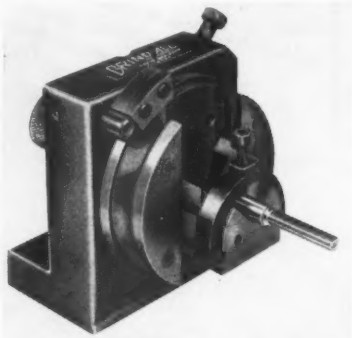
announced by Samuel Olson Mfg., Inc., 2423-27 Bloomingdale Ave., Chicago 47, Ill. Literature is available on request.
Circle Inform-A-Gram No. A33.

Rotary Limit Switch. One of the most recent control devices to reach the market is this rotary limit switch with a cam and gear mechanism.



Its primary application is for reversing movements between two limits. It is manufactured by Gemco Electric, 25685 W. 8 Mi. Rd., Detroit 19, Mich., and literature is available.
Circle Inform-A-Gram No. A34.

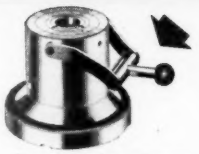
Perforator Grinding. Designed for fast, more versatile and more economical perforator grinding operations, this "Grind-All" grinds all types of regular and irregular con-



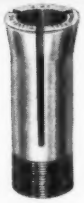
tours concentric with perforator shank within ± 0.0002". Detailed literature on the construction and operation of this unit is available from the Harig Mfg. Corp., 5757 W. Howard St., Chicago, Ill. The bulletin offered gives outstanding features of the grind-all fixtures such as how it can be used for carbide grinding, inspection, light milling and radius dressing.
Circle Inform-A-Gram No. A35.

Always on the alert!

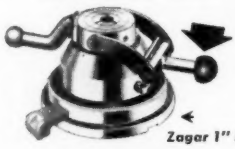
now, bigger and better handles on Zagar FIXTURES



Zagar 2" holding fixture.



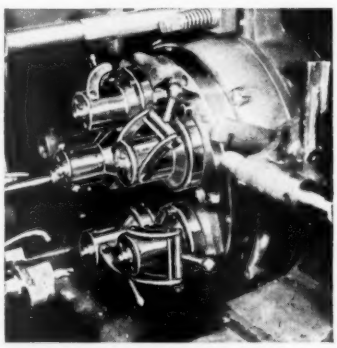
Zagar 5-C pull type collet.



Zagar 1" indexing fixture.

Not in itself a radical change, but illustrating an old, steady determination to keep on improving every Zagar product whenever possible. All the well known advantages of Zagar design: rigid holding, accurate construction, quality finish, and the dependability that goes with Zagar's 15-year-old standards. Also a complete line of air-operated holding fixtures and collet lathe chucks.

♦ ♦ ♦



INTERESTING ZAGAR APPLICATION

Five standard 1" holding fixtures mounted on Goss & DeLeeuw chucking machine. Operation consists of milling, reaming, and counterboring. Fixtures are provided with internal stops for correct depth. Close tolerances to print specifications are held easily.

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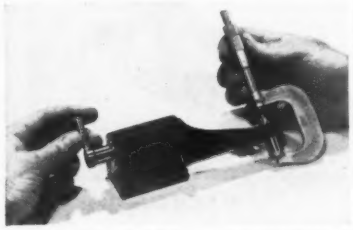
Ask on your letterhead for Engineering Manual T-5

ZAGAR TOOL, INC.
24000 LAKELAND BLVD., CLEVELAND 23, O.

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

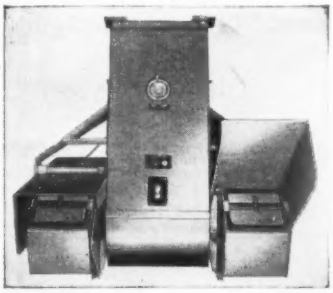
CIRCLE INFORM-A-GRAM KEY NO. 118D

Precision Radius Dresser. This instrument is designed to give the machinist perfect "feel of the wheel". Angles tangent to radii can be quick-



ly and accurately set. Complete data available from General Scientific Corp., 603 N. La Brea Ave., Los Angeles, Calif.
Circle Inform-A-Gram No. A36.

This Twin Barrel Finisher represents a new idea in handling convenience. It involves the use of moveable chutes under the barrels which can be tilted to the rear to drain off liq-



uids, and then can be tilted forward to deliver the load to proper containers. For further information write to Rampe Mfg. Co., 3320 St. Clair Ave., Cleveland 14, Ohio.
Circle Inform-A-Gram No. A37.

A New Portable Pneumatic Riveter, said to be the only hand tool of its kind on the market, has been introduced by the Lemert Engineering

Co., Plymouth, Ind. This hand tool easily gets into hard-to-reach places and unusual positions.
Circle Inform-A-Gram No. A38.

PRECISE
hole location,
easy contour
inspection with
new machine
tool microscope

Any machine shop, large or small, can save time and money on milling and boring work with the new Perkin-Elmer Model 11 Machine Tool Microscope. For hole location, its wide field of view (¼") or 30x magnification makes it possible to gage accurately to a ten thousandth—*at a glance.*

Mount the Model 11 on an offset bracket or directly in the spindle—it will fit nearly any machine tool. When offset it can be used for transferring hole locations from template to workpiece. The image always appears erect and moves in the same direction as the work, making it ideal for checking contours, slots, surface conditions. The Model 11 Microscope is compact, sturdy, rugged—designed for long life, accurate service.

Write today for complete details.

THE PERKIN-ELMER CORPORATION NORWALK, CONNECTICUT

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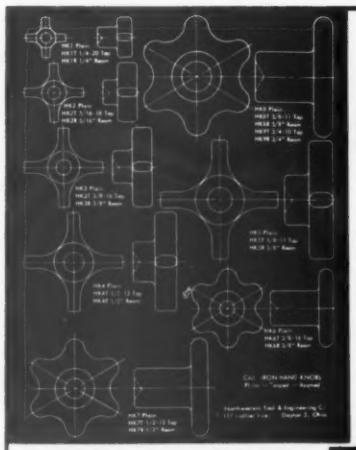

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Northwestern
116 HOLLIER AVE., DAYTON 3, OHIO

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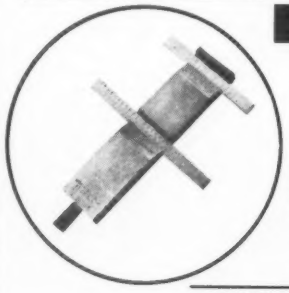

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KOENIG
— TWO SEAT —
Vernier Depth Gauge

Easy, quick and accurate measurements. Unlimited use due to compact design. End-slotted head makes difficult measurements easy. Machine divided graduation to read in thousandths of an inch. Hardened, ground and lapped head—⅜"x⅞"x3¾". End-hardened, tool steel scales—3/32"x ¼" wide. All scales allow full length to 8". Hook scales of any size available.

Descriptive Literature Available

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At Low Cost... to Meet High Production Schedules

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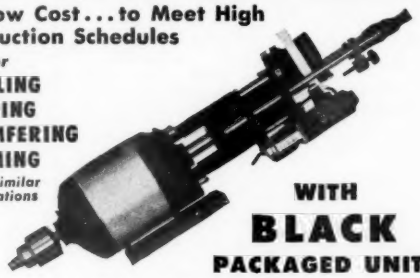

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PACKAGED UNITS

Self-contained—operate in any position. Easy to design into special purpose set-ups for single or sequential operations.

Black employs new principle—traversing motor shaft is work spindle. Torque applied uniformly with practically no end play. Air feed advances tool rapidly to work—hydraulic control gives uniform feed to end of work cycle. Tapping unit controlled so tap follows own lead. No chamfering first thread. No stripping on return stroke. Depth accuracy to within .001". Simple adjustments. Wide range of sizes and speeds. Step-drilling controls available.

Write for descriptive literature.

THE BLACK DRILL COMPANY, INC.
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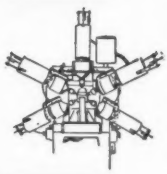

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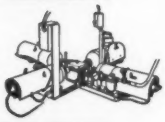

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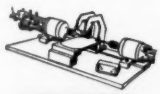

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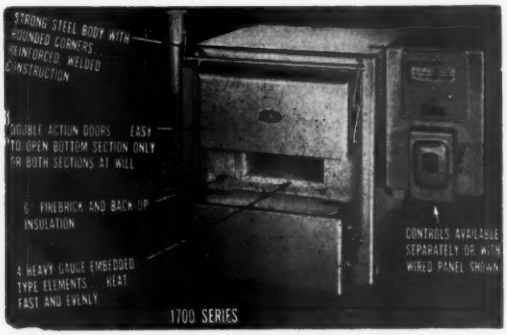
CUT HEAT-TREAT COSTS

. . . with this versatile Temco bench furnace

. . . for heat-treating dies, parts, tools, etc.


STRONG STEEL BODY WITH ROUNDED CORNERS REINFORCED WELDED CONSTRUCTION
DOUBLE ACTION DOORS EASY TO OPEN BOTTOM SECTION ONLY OR BOTH SECTIONS AT WILL
6" FIREBRICK AND BACK-UP INSULATION
4 HEAVY GAUGE EMBEDDED TYPE ELEMENTS HEAT FAST AND EVENLY
CONTROLS AVAILABLE SEPARATELY OR WITH WIRED PANEL SHOWN
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Speed production, lower unit costs with this husky electric furnace. Large enough to take a wide variety of work, yet compact and exceptionally convenient to use. Chamber sizes—9½" wide, 8½" high and 13½" or 18" deep. Heating range 350° to 1900° F., 220 V. operation. Price with controls, $297.50 to $507.50. Furnace only $235 to $285. Write for literature and nearest dealer's name.

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ELIMINATE* HUMAN ERRORS

WITH INDICATING MICROMETER & COMPARATOR

COMPARATOR MASTER MICROMETER GO-NO GO GAGE 1" RANGE IN 10000ths-NO GAGE BLOCKS NEEDED

* HUMAN ERRORS THROUGH DIFFERENCES OF "FEEL" ELIMINATED. WILL DETECT OUT-OF-ROUNDNESS, OVALNESS AND TAPER.

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GEORGE SCHERR CO., Inc.
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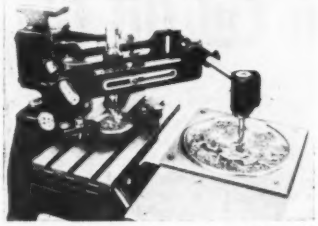
CIRCLE INFORM-A-GRAM KEY NO. 120D

A New 3-Dimensional Engraving Machine which will engrave steel, other metals, plastics, wood and similar materials in ratios ranging from



1.7:1 to 7:1 has been introduced by the H. P. Preis Engraving Machine Co., 282 Industrial Branch, Hillside, N. J. Complete details available.
Circle Inform-A-Gram No. A39.

The Improved Di-Profiler can be rocked or rotated to conform with the contour of the die or part being worked. This feature makes the precision machine a high production

substitute for the old hand method of die filing and finish. Full details will be furnished by Nord International Corp., 449-139 Central Ave., Orange, N. J.
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Fixture Keys, Spring Plungers, spring stops, torque screws, toggle pads and swivel screws, all of hardened steel, have been added to line of Siewek drill jigs, fixture clamps

and fixture details. Engineering data sheets showing the wide variety of styles and sizes available can be had. Write to the Siewek Tool Co., 2862 E. Grand Blvd., Detroit 2, Mich., or—
Circle Inform-A-Gram No. A41.

"- - - and then one day I made my fortune by switching the shop to Columbia SUPERDIE."

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.
Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

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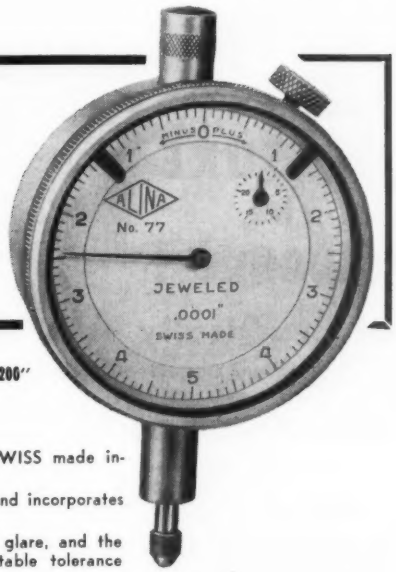
New! DIAL INDICATOR Alina No. 77



- Graduated — .0001"
- Reading — 0-50-0
- Range — .200"
- Jeweled
- Shock Proof
- Revolutions of Hand — 20

The ALINA No. 77 is a large capacity SWISS made indicator.
The steel case is DULL CHROME plated and incorporates a removable back plate.
The dial is especially treated to eliminate glare, and the graduations are fine and distinct. Adjustable tolerance hands are built into the bezel.
The ALINA No. 77 also features the popular DOUBLE DIAL and TELL TALE HAND.
The indicator is supplied in a handsome formfitting case.
Parts and service are always available in New York City.

Ask your dealer or write

$26.80
in handsome contour case
F.O.B. New York

ALINA CORPORATION • 401 Broadway • New York 13, N. Y.

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LAPPING AND GRINDING COMPOUNDS

GRADE 17 (Medium) GRADE 18 (Medium Fine)
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SPECIAL COMPOUNDS FOR BRASS AND BRONZ

PLUG COCK VALVES

Also **precision lapping compounds** for gages, tools, instruments. Write for **free** sample kit containing six liberal jars, different grades.

Photo courtesy Hays Mfg. Co.

These three grades of compounds have a special water soluble base that possesses excellent lubricating qualities for grinding various styles of plug and key cock valves. These compounds do not "niggard or score" while grinding —a common trouble with most compounds. They contain abrasives of the proper grit size for grinding or lapping-in brass and bronze plug valves. The finished parts can be washed with ordinary water.

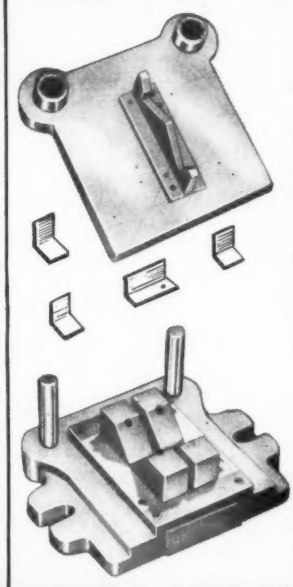
Generous samples sent upon request

UNITED STATES PRODUCTS CO.
518 MELWOOD ST. USP Co. PITTSBURGH, PA.

CIRCLE INFORM-A-GRAM KEY NO. 122A

Punches and Dies

Angle Iron Cut Off Die



No. 18, cut off die, for 2"x2"x¼" and lighter angles. Mounted in leader pin die set. Fits 'most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.

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What are your punch and die needs? Consult us about your problems. Prompt service on "specials" made to your order.

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WARD Machinery Co. 564 West Washington **Chicago 6**

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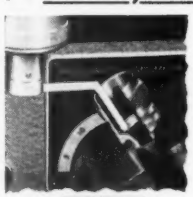
You can **MEASURE** the **ROUGHNESS**

of practically **ALL** surfaces
(internal and external—flat, round, and tapered)

with the **PROFILOMETER**®
(quickly—dependably—in the shop—in microinches)

. . ***thereby saving time and money in unexpected ways!***



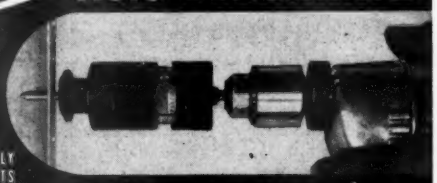
FREE BULLETIN LT89
gives details—shows production and quality control applications. Write for it!

Profilometer is a registered trade mark.

MICROMETRICAL MANUFACTURING COMPANY
345 S. MAIN ST. ANN ARBOR 14, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 122C

NOW AUTOMATIC Hole DEBURRING

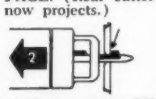


AUTOMATICALLY DEBURRS PARTS LIKE THESE!

with **NOBURMATIC TOOL**

New Noburmatics deburr and chamfer front and inaccessible back hole faces in ferrous and non-ferrous sheets, plates, extrusions, castings and forgings ***in one automatic operation.*** Used in drill motors or stationary machine tools, Noburmatics produce uniform deburring with high accuracy, increase production line speed. Made in all drill sizes from ⅛" (.125) to F(.256).

Entry Noburmatic enters hole, advances to limit stop, DEBURRS FRONT FACE. (Rear cutter now projects.)



Withdrawal BACK FACE DEBURRED. Cutter automatically retracts. Tool ready for next cycle.

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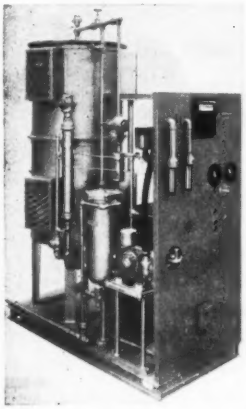
NOBUR MANUFACTURING COMPANY
717 N. VICTORY BLVD., BURBANK, CALIF.

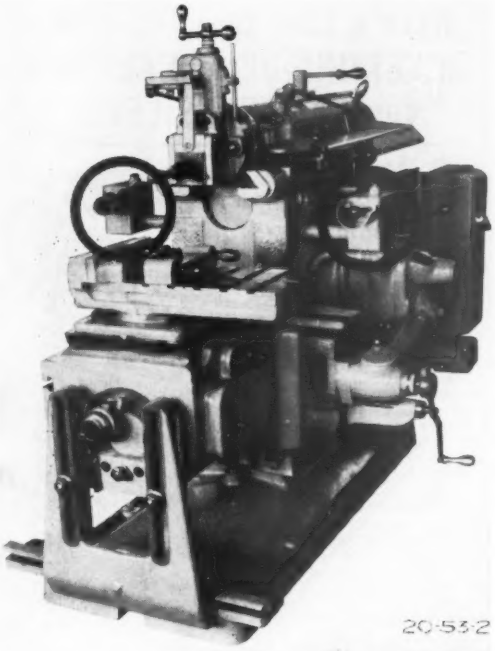
CIRCLE INFORM-A-GRAM KEY NO. 122D

Amplifying Gages & Comparators under the trade names "Millimess" and "Compar-It", respectively, have been introduced by George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y. These instruments can be used in many types of comparison indicating gages and may be built into machinery, fixtures, special gages, etc. An illustrated circular on the instruments is available. **Circle No. A42.**



Endothermic Gas Generator. Available in 3 sizes (300, 500, 750 cubic feet per hour) this Endothermic Gas Generator is of functional design with easily removable parts which make inspection and maintenance a simple matter. The generator will produce controlled atmosphere of consistent chemical analysis for heat treating operations. For more detailed information write to the Hevi Duty Electric Co., 231 W. Michigan St., Milwaukee 1, Wis., for Bulletin 753.
Inform-A-Gram No. A43.

Metal Working Shapers. A dual-control is offered as an extra feature for the electro-magnetic brake and clutch on Cincinnati metal working shapers. The additional control permits more efficient handling of large



awkward work which obstructs the operator's view from the normal working position. Other features added to the machine are automatic tool lifters, power down feed to the head with automatic stop and an auxiliary front cross feed screw. Literature is available from the Cincinnati Shaper Co., Hopple & Elam St., Cincinnati 25, Ohio. **Circle Inform-A-Gram No. A44.**

CHALLENGE
Surface Plate Equipment

MADE OF HIGH-GRADE SEMI-STEEL — HEAT TREATED AND PRECISION GROUND

STRAIGHT EDGES — For scraping planer and lathe bed ways . . . parallel straight edges for inspection of alignment and bearing surfaces of machine tools.

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No motors — No belts — No sprockets

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JACO Stock Reels handle all types of resilient coiled stock for light stampings up to 250 lb. coil weight . . . up to 36" coil diameter . . . up to 6" stock width.

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"SV" Standard . . . and "PA" for Use With Compressible Materials

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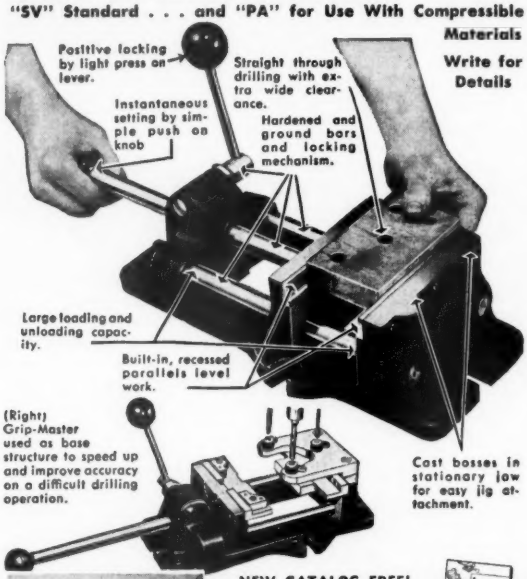
Positive locking by light press on lever.
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Hardened and ground bars and locking mechanism.
Large loading and unloading capacity.
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Cast bosses in stationary jaw for easy jig attachment.

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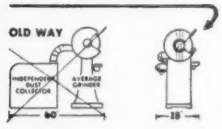
Hammond of KALAMAZOO

2 IN 1 NO-DUST GRINDER

SAVE OVER 50% FLOOR SPACE THE HAMMOND WAY



DUST-LADEN AIR IS A MENACE!

- Protect your employees' health.
- Protect nearby machine tools from dust and grit.
- Save floor space — requires only 6½ square feet. For 10", 12", and 14" wheels. Write for Catalog.

Hammond Machinery Builders INC.

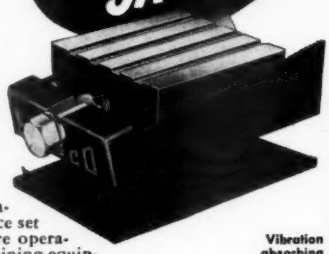
1631 DOUGLAS AVENUE ● KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 124C

Here's how to SAVE TIME in SETTING-UP and KEEPING your MACHINES LEVEL

Fast Accurate Self-Aligning Machine Leveler

Empco JACK



Empco Jacks enable you to meet hurry-up demands for relocation of machinery by giving you the fastest, easiest, most accurate machine leveling ever known: you simply raise or tilt machine sufficiently to allow the Empco Jacks to be slipped under base. The number of jacks required depends on weight of machine and size of base. Once set on Empco Jacks, the entire operation of leveling and maintaining equipment level is quickly done. By applying a wrench to the "hex" head of adjusting screw, an adjustment is obtained either up or down until your level indicator reads "zero." Write for specifications and prices today.

Vibration absorbing mounting pads increase machinery life.

EMPCO PRODUCTS

THE ENTERPRISE MACHINE PARTS CORPORATION

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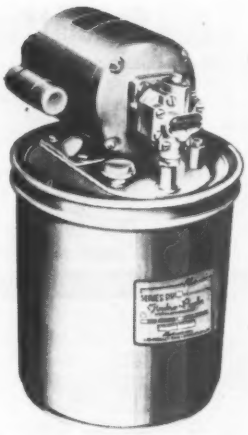
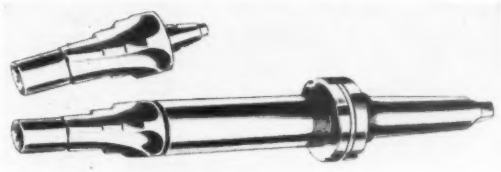
CIRCLE INFORM-A-GRAM KEY NO. 124D

Hydraulic Pumping Unit. Specially designed for use with Modernair components and systems to provide "on-the-spot" low pressure hydraulic power and volume output is the DU Series, Modernair low pressure hydraulic pumping unit. A descriptive bulletin on the advantages of this machine is available from the Modernair Corp., 400 Preda St., San Leandro, Calif. The unit includes a five-gallon reservoir, breather, dip stick, overload protection and capacitator and relief valve set for 200 psi.

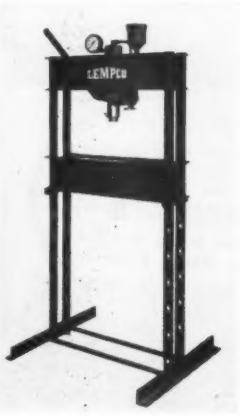


Inform-A-Gram No. A45.

These Are Taper Interchangeable Drive Tools and can be applied to any shank type tool, either



high speed or carbide tipped. They are produced by the Falcon Tool Co., P.O. Box 4605, 20771 Ryan Rd., Detroit 34, Mich. Write for Catalog '53 which explains the tools in detail or— **Circle No. A46.**



25-Ton Hydraulic Press. Lempco Products, Inc., Dunham Rd., Bedford, Ohio is now marketing a new 25-ton press that because of its simplicity, rugged construction and versatility is expected to be well received in the smaller automotive repair shops for work on universal joint pins, axle bearings, bushings, timing gears and ring gear riveting. Two-speed ram travel and ram pressure release valve are two important features of this press. Further information available upon request.

Inform-A-Gram No. A47.

Superpower Permanent Magnet Chucks are an important addition to the Taft-Peirce extensive line of magnetic chucks. Of an entirely new design, they are very

compact and 15 to 20 per cent lower in height. They can be readily used in surface grinding, light milling, planing and shaping. Write to Taft-Peirce Mfg. Co., Woonsocket, R. I., for further information, or— **No. A48.**

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1. Stainless Steem beams and Verniers
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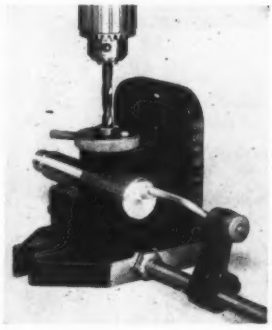
CIRCLE INFORM-A-GRAM KEY NO. 125A

NEW ADJUSTABLE DRILL JIG

eliminates layout; cuts drilling time



Used for drilling holes through round stock and hex stock from ¼" to 2" and cap screws from ¼" to 1¼", the new Mathewson Adjustable Drill Jig eliminates layout and can cut drilling time on small lots to a fraction. And it eliminates the costs of special jigs for larger quantities. Holes for cotter pins, set screws, drive pins for bayonet joints, oil holes in tubular sections, and wiring holes in cap screws, are all typical of the operation that can be done more economically with this jig. Hole diameters range from .052" to .531", using your A.S.A. standard slip bushings. The hardened V-block has two 60-degree V's for centering round or hexagonal stock, one for ¼" to 21/32" diameter, one for 21/32" to 2" diameter. Adjustable stop for locating work longitudinally for drilling any distance from end, may be used on either side. Adjustable bushing carriers hold slip bushings and clamp work securely. Jig highly successful in permitting use of inexperienced drill operators. For circular write to: **Mathewson Machine Works**, 38 Hancock St., Quincy, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 125B

Carry Your Inspection to the Machine
with Acme's New Portable
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Use Magnetic or Standard Indicators Directly on the Bed Area
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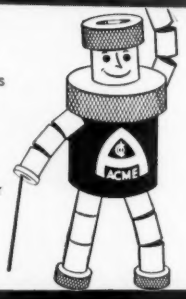
Fits any 12" Surface Plate



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Save Time and Money
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NEED Special taps IMMEDIATELY?

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The following partial list includes only those taps most frequently needed. Let us know your requirements. Telephone now.

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MACHINE SCREW TAP SIZES		
#00	80	96
#0	64-72	64-72
#1	56-64	48-56
#2	48-56	48-80
#3	36-40-48	36-40-44-52
#4	40-44	32-36-80-90
#5	32-40	32-36-48-60-64-72
#6		24-30-36-44-48-50-56-64
#7	32-36	30-32-36-40-44-48-64
#8		30-40-56-60
#9	24-32	24-30-32-36-40
#10	24-28	28-30-36-40-48-60
#12	20-24	20-32-36-40-48-56-60
#14		18-28-32-40
#16		18-30-22-28-32-36
#18		18-30-32-36
#20		16-18-20-32
#22		14-16-18

HAND TAP SIZES		
¼	20-28	8-18-22-24-27-30-32-33-36-40-42-48-50-56-60-72-80
5/16	18-24	12-14-16-20-22-27-29-30-32-36-40-44-48-56-72
⅜	16-24	9-12-14-18-20-36-37-28-32-36-40-46-48
7/16	14-20	12-16-24-27-28-30-32-40
½	13-20	10-11-12-14-16-18-24-27-28-30-32-36-40
9/16	12-18	14-16-20-24-27-28-30-37
⅝	11-18	10-12-14-16-20-24-27-28-32-36-40-48
11/16	10-16	12-14-20-24-27-28-30-32-40
¾		10-12-14-16-20-24-28-32
13/16	9-14	8-10-12-13-16-18-20-28-40
1	8-14	7-10-11-12-16-18-20-24-27-32
1 1/16		12-14-16-18-20-32
1 1/8	7-12	8-16-20-24-28-32
1 3/16		10-12-14-18-20
1 1/4	7-12	8-18-16-16-18-20-24
1 5/16		:2-14-16-24-26-32-36-40
1 3/8	6-12	8-10-14-16-18-20
1 7/16		8-12-14-16-18-20-24
1 1/2	6-12	5-8-10-13-14-16
1 9/16		6-12-18-20-32
1 5/8		3½-8-10-13-14-16-18-20-24-36
1 3/4		8-10-12-16-18
1 13/16		10-16-20-32-40
1 7/8		5-8-10-11-12-14
1 15/16		8-11-14-16-20
2		6-8-10-12-14-16-18-20
2 1/16		64-72
2 1/8		48-50-80
2 3/16		32-40-44-48
2 1/4		24-28-32-36-40-48
2 5/16		24-28-32-36-40
2 3/8		24-28-30-32-36-40
2 7/16		20-28-31-32-40
2 1/2		20-24-28-32-40-48
2 9/16		16-18-32

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LEVIN® MICRO-DRILL PRESS
FOR VERY SMALL HOLES DOWN TO .002"

Designed to hold small drills in precision collets, thus overcoming the difficulty of making a drill run true as when held in a conventional drill chuck. Absence of a sliding quill guarantees maximum sensitivity with fingertip control. A mounted ⅛" capacity chuck can also be used.

Send for Catalog L describing Micro-Drill Press, full range of collet sizes, accessories and other precision tools

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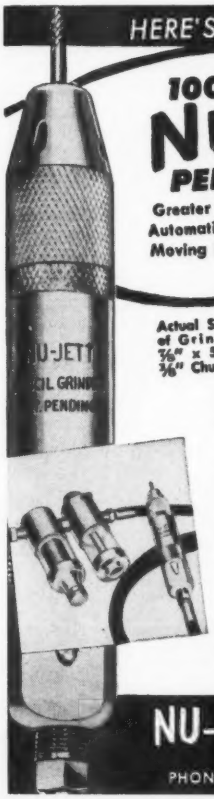
HERE'S THE NEWEST
100,000 R.P.M.
NU-JETT
PENCIL GRINDER

Greater Power — New Safety Guard — Automatic Lubrication. Weighs 5 oz.—One Moving Part.

Actual Size of Grinder 5/16" x 5 1/16" ⅛" Chuck



NU-JETT DOES ANY FINE PRECISION GRINDING, POLISHING, FINISHING. Use it for Etching, Deburring, Die Work, Carving on Wood, Metal, Rubber and Plastic.

Air driven on 50 lbs. pressure or more, very smooth in operation, compact, it truly handles like a pencil.

New Low Cost Package $42.50

Here is an outstanding value that includes NU-JETT GRINDER, our new Air Filter, Automatic Lubricator, Hose and Chuck Wrench.

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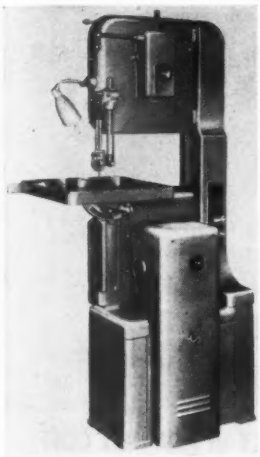
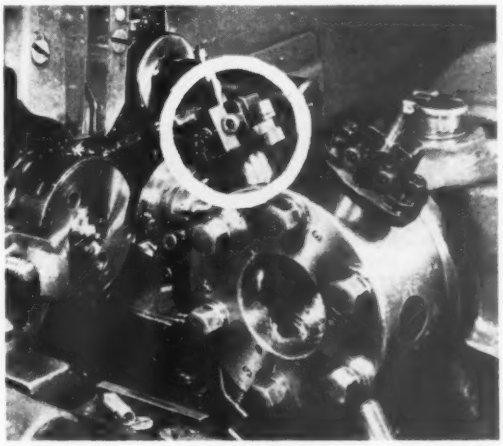


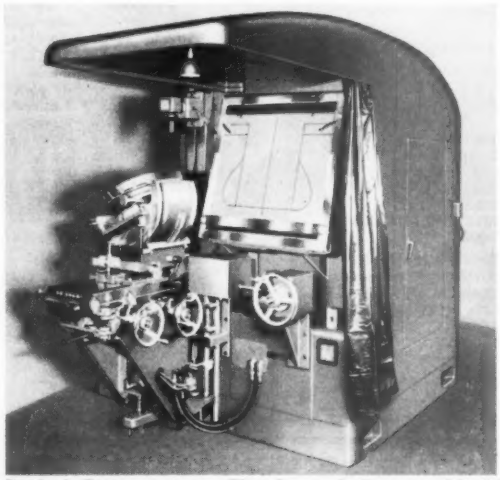
A New Variable Speed Band Saw having a speed range from 50 to 4,500 surface feet per minute has been announced by the Walker-Turner Division, Kearney & Trecker Corp., Plainfield, N. J. This is reportedly the first time a 16" band saw in the light-heavyweight class has been made with such a complete range of speeds. The speed range factor enables the machine to be used on all types of ferrous and non-ferrous metals, plastics, wood and composition. Further information and literature may be obtained.

Inform-A-Gram No. A49.

Tool Holder. Here are some of the advantages of the new model Brookfield Tool holder: Smaller physical outline; approximately 25% lighter; adjustable V-jaw fea-



ture; axially true design; and balanced-pressure locking assembly. Additional information will be happily furnished by Brookfield, Inc., 172 Newbury St., Boston 16, Mass. **Circle Inform-A-Gram No. A50.**



Optical Comparators. The Jones & Lamson Machine Co., Springfield, Vt., has a line of optical comparators that will inspect slot contour, angular locations, and spacings on gas turbine discs from 12" to 36" diameter. Further information is available.

Circle Inform-A-Gram No. A51.

What FEATURES do YOU WANT in a UNIVERSAL JOINT?

- Maximum strength and bearing surface
- Quick-acting, dependable response
- Long service-life
- Optimum operating angle
- Close quarter operation
- Accurate surface grinding
- High concentricity
- Minimum weight

LOVEJOY HAS THEM ALL!

Available in 13 standard sizes—diameters ½" to 4" —bore ¼" to 2"—lengths 2" to 10⅝"

WRITE NOW FOR CATALOG AND PRICES

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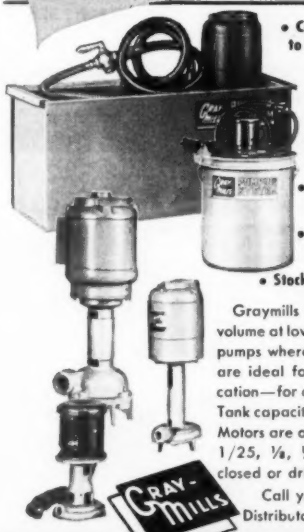
Manufacturers of flexible couplings, universal joints, variable speed pulleys and variable speed transmissions.

CIRCLE INFORM-A-GRAM KEY NO. 127A

Only GRAYMILLS COOLANT PUMPS give you ALL these advantages



- Complete systems, with fittings, to fit any standard machine tool.
- Easily installed—in a matter of minutes
- A size for every need—38 standard models—Pumps only or Pump and Tank Units
- Can be used with liquids bearing abrasives
- Dependable—long wearing—economical to use
- Stocked by distributors everywhere

Graymills Centrifugal pumps, for high volume at low pressures, or Graymills Gear pumps where high pressures are desired, are ideal for every machine tool application—for coolants, oils and compounds. Tank capacities range from 2 to 128 gals. Motors are of nationally known quality in 1/25, ⅛, ¼ and ½ H.P., totally enclosed or drip-proof.

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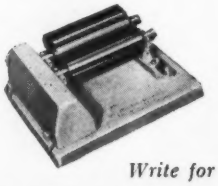
A NEW, large size Flat Lapping Machine of improved design for precision lapping of any material where a perfectly flat surface is necessary. Extremely close tolerance finishes are possible. An ideal machine for producing mating surfaces of sliding and rotating parts of air and liquid tight seals, plastic and die casting molds.



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For lapping cylinders to accurate, mirror-like finishes in less time than any other method. Saves up to ⅔ time in lapping.

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MADE OF HIGH SPEED or CARBIDE
FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES

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- FAST PERFORMANCE
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Cutting Edges are lapped for better "Bores" and faster Feeds.

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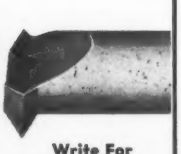
- CONSTANT CLEARANCE
- CONSTANT SHAPE OF CROSS SECTION
- EASY RESHARPENING
- CONVENIENT TO USE
- LONG LIFE

✓ INTERNAL THREADING TOOL
- CONSTANT SHAPE AND CLEARANCE
- EASY RESHARPENING
- CONVENIENT TO USE - LONG LIFE



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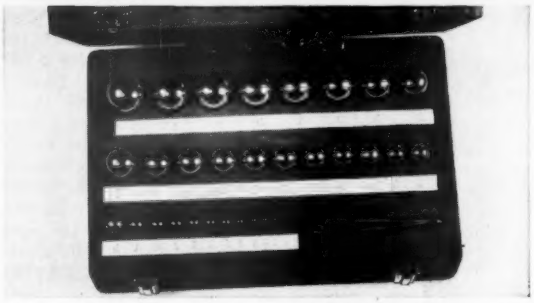
CIRCLE INFORM-A-GRAM KEY NO. 128C

SETS of Super-Precision MASTER BALLS



For GAGE BLOCK ACCURACY at NOMINAL COST

- IDEAL FOR USE in setting comparator gages — as masters and measuring standards.
- SUPER-ACCURATE — to 0.000010".
- TWO SETS, 1/16" to 1" diameter: Set No. 16 — 16 balls in 1/16" increments. Set No. 32 (shown above) — 31 balls in 1/32" increments.

EVERY shop, tool room and gage room will find many uses for these ITI Master Balls. *Write for free bulletin!*

INDUSTRIAL TECTONICS, Inc. ANN ARBOR 7, MICH.

ITI PRECISION BALLS
All Materials — All Sizes
In Large or Small Quantities

CIRCLE INFORM-A-GRAM KEY NO. 128B

Take the GLARE out of Micrometer Reading with the "Lustro-Chrome" MICROMETER

MEASURE TO 1/10,000 th

ALL GRADUATIONS ARE WELL-DEFINED BLACK LINES ON DULL CHROME SURFACE WHICH MEANS EASIER AND SURER READING, EVEN IN POOR LIGHT.

GUARANTEED ACCURATE WITHIN ONE HALF OF A TEN THOUSANDTH OF AN INCH.

THE CHROME SURFACE IS EXTREMELY HARD AND NON-PEELING. IT PROTECTS THE TOOL INDEFINITELY FROM RUST AND DISCOLORATION.

DROP-FORGED MODEL WITH CHROME FINISHED MICROMETER HEAD, 10th VERNIER, FROM $9.25 up.

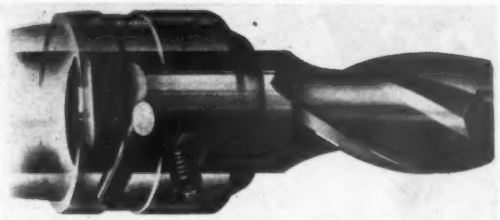
No. 901 C 0-1" size with LOCK NUT and RATCHET and 10th vernier as shown $13.25

This tool with TUNGSTEN CARBIDE tipped anvils $15.75

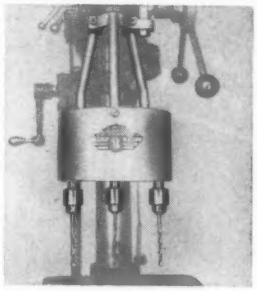
Dealers ! Here's a real profitable line

ASK FOR CATALOG ON OUR COMPLETE LINE OF MICROMETERS IN ALL SIZES.

GEO. SCHERR CO., INC.
COMPLETE LINE OF PRECISION INSTRUMENTS
200-T LAFAYETTE STREET • NEW YORK 12, N. Y.
CIRCLE INFORM-A-GRAM KEY NO. 128D



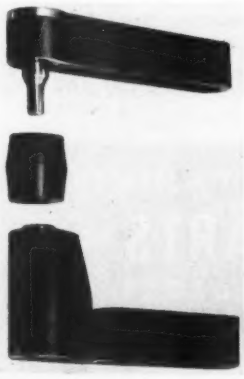
A New Type of End Mill and Holder which reduces tool costs as much as 25% has been announced by the Putnam Tool Co., 2981 Charlevoix Ave., Detroit 7, Mich. Write for further information. **Inform-A-Gram No. A52.**



A Low Cost, Quick Set-Up multiple drill head attachment for production drilling in metal, wood, or plastic has been announced by the Silver King Corp., Aurora, Ill. These tools were production tested for over a year in several plants without "run-out" or breakdown. Write direct to the Company for details, or— **A53.**

A New High Temperature Thread Compound that protects against the welding action of threaded connections subjected to extreme heat for for a long period of time has been developed by Crane Packing Co. For complete details write Dept. TPC, 1800 Cuyler Ave., Chicago 13, Ill., or—
Inform-A-Gram No. A54.

Coil Grab. A new 1,000 lb. capacity coil grab, with a five to one safety factor has been introduced by Dixon Automatic Tool, Inc., 2300 23rd Ave., Rockford, Ill. Weighing less than 25 lbs., the new semi-automatic coil grab is particularly well suited for the plant with limited head room and is designed especially for narrow coils, but will take coils up to 8" in width. Operation is simple and requires only one man. Complete data available. **Circle No. A55.**



For Greater Positioning Flexibility, this new R-B retainer is especially suited for short production runs on light gauge metals and where die cost is a greater factor than usual. They are easily adjusted to any desired position on T slotted or drilled and tapped commercial die sets. Further information is available from Allied Products Corp., 1560 E. Milwaukee Ave., Detroit 11, Mich.
Inform-A-Gram No. A56.

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- **Magnetic base holds TOOL & DIE CHECKER in any desired position on workpiece.**
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Fine precision adjustment identical to surface gauge.
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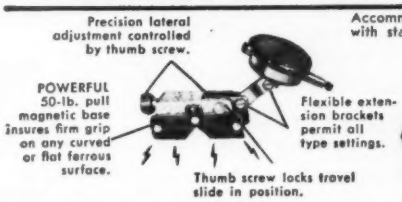
Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surfaces curved or flat.

FOR SMALL TEST INDICATORS Model 200B Price $5.45

TAKE SECONDS—NOT HOURS


Precision lateral adjustment controlled by thumb screw.
Accommodates all indicators with standard ¼" lug back.
POWERFUL 50-lb. pull magnetic base insures firm grip on any curved or flat ferrous surface.
Flexible extension brackets permit all type settings.
Thumb screw locks travel slide in position.

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CIRCLE INFORM-A-GRAM KEY NO. 129B

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Diamond Powder—its Production and Use
Polishing Gem Stones for Jewelry
Manufacture of Watch and Instrument Jewels
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2	17	33	72	88A	98.3	112C	116D	121A	126B	136	143F	149	153D	160C
3	18	34	73	88B	98.4A	112D	117A	121B	126C	137	145A	151A	153E	160D
4	19	35	74A	89A	98.4B	112E	117B	122A	126D	139A	145B	151B	153F	161
5	20	36	74B	89B	100	113A	117C	122B	127A	139B	145C	151C	154	162
6	21	38	76	90	101	113B	118A	122C	127B	139C	145D	151D	155	163A
7	22	39	77	91	102	113C	118B	122D	128A	139D	145E	151E	156	163B
8	23	40	78	92	103	114A	118C	123A	128A	141A	147A	15xA	157A	163C
9	24	63	79	93	104	114B	118D	123B	128C	141B	147B	152B	157B	163D
10	26	64	80	94	105	114C	119A	124A	128D	141C	147C	152C	157C	163E
11	27	65	81	95	106	114D	119B	124B	129A	141D	147D	152D	157D	165
12	28	66	82	96	107	115A	119C	124C	129B	143A	148A	152E	159A	166
13	29	67	83	97	108	115B	120A	124D	130	143B	148B	152F	159B	
14	30	68	85	98A	109	116A	120B	125A	133	143C	148C	153A	159C	
15	31	69	86	98B	112A	116B	120C	125B	134	143D	148D	153B	160A	

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3	18	34	73	88B	98.4A	112D	117A	121B	126C	137	145A	151A	153E	160D
4	19	35	74A	89A	98.4B	112E	117B	122A	126D	139A	145B	151B	153F	161
5	20	36	74B	89B	100	113A	117C	122B	127A	139B	145C	151C	154	162
6	21	38	76	90	101	113B	118A	122C	127B	139C	145D	151D	155	163A
7	22	39	77	91	102	113C	118B	122D	128A	139D	145E	151E	156	163B
8	23	40	78	92	103	114A	118C	123A	128A	141A	147A	152A	157A	163C
9	24	63	79	93	104	114B	118D	123B	128C	141B	147B	152B	157B	163D
10	26	64	80	94	105	114C	119A	124A	128D	141C	147C	152C	157C	163E
11	27	65	81	95	106	114D	119B	124B	129A	141D	147D	152D	157D	165
12	28	66	82	96	107	115A	119C	124C	129B	143A	148A	152E	159A	166
13	29	67	83	97	108	115B	120A	124D	130	143B	148B	152F	159B	
14	30	68	85	98A	109	116A	120B	125A	133	143C	148C	153A	159C	
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A1	A13	A25	A37	A49	B5	B17	B29	B41	B53	B65	C6	E5
A2	A14	A26	A38	A50	B6	B18	B30	B42	B54	B66	C7	E6
A3	A15	A27	A39	A51	B7	B19	B31	B43	B55	B67	C8	E7
A4	A16	A28	A40	A52	B8	B20	B32	B44	B56	B68	C9	E8
A5	A17	A29	A41	A53	B9	B21	B33	B45	B57	B69	D1	E9
A6	A18	A30	A42	A54	B10	B22	B34	B46	B58	B70	D2	E10
A7	A19	A31	A43	A55	B11	B23	B35	B47	B59	B71	D3	F1
A8	A20	A32	A44	A56	B12	B24	B36	B48	B60	C1	D4	F2
A9	A21	A33	A45	B1	B13	B25	B37	B49	B61	C2	E1	
A10	A22	A34	A46	B2	B14	B26	B38	B50	B62	C3	E2	
A11	A23	A35	A47	B3	B15	B27	B39	B51	B63	C4	E3	
A12	A24	A36	A48	V4	B16	B28	B40	B52	B64	C5	E4	

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A3	A15	A27	A39	A51	B7	B19	B31	B43	B55	B67	C8	E7
A4	A16	A28	A40	A52	B8	B20	B32	B44	B56	B68	C9	E8
A5	A17	A29	A41	A53	B9	B21	B33	B45	B57	B69	D1	E9
A6	A18	A30	A42	A54	B10	B22	B34	B46	B58	B70	D2	E10
A7	A19	A31	A43	A55	B11	B23	B35	B47	B59	B71	D3	F1
A8	A20	A32	A44	A56	B12	B24	B36	B48	B60	C1	D4	F2
A9	A21	A33	A45	B1	B13	B25	B37	B49	B61	C2	E1	
A10	A22	A34	A46	B2	B14	B26	B38	B50	B62	C3	E2	
A11	A23	A35	A47	B3	B15	B27	B39	B51	B63	C4	E3	
A12	A24	A36	A48	V4	B16	B28	B40	B52	B64	C5	E4	

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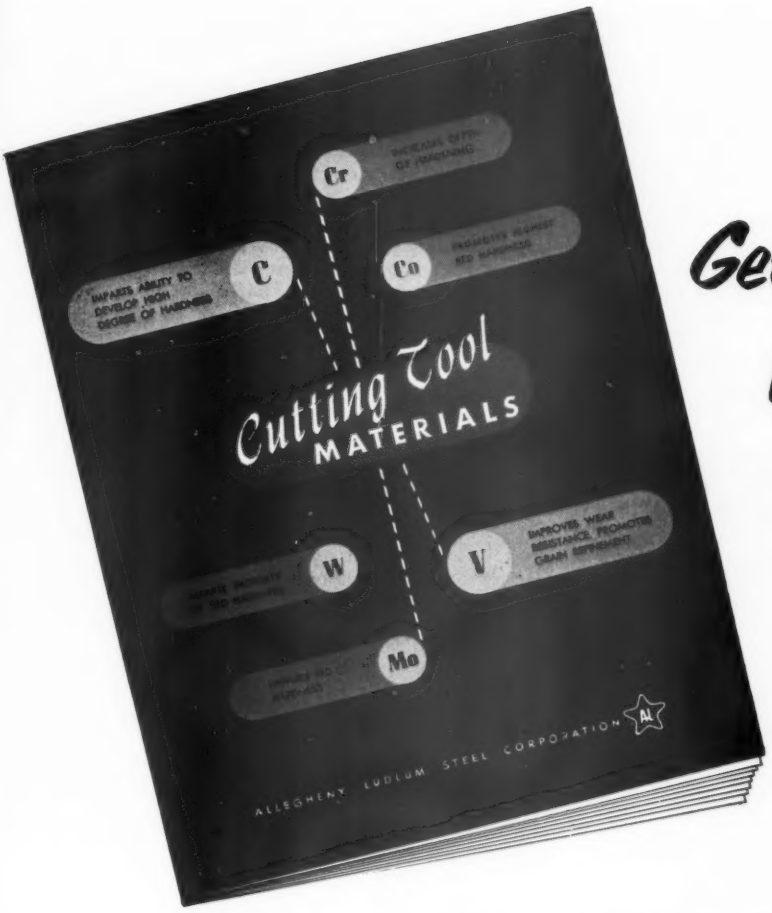

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CIRCLE INFORM-A-GRAM KEY NO. 133

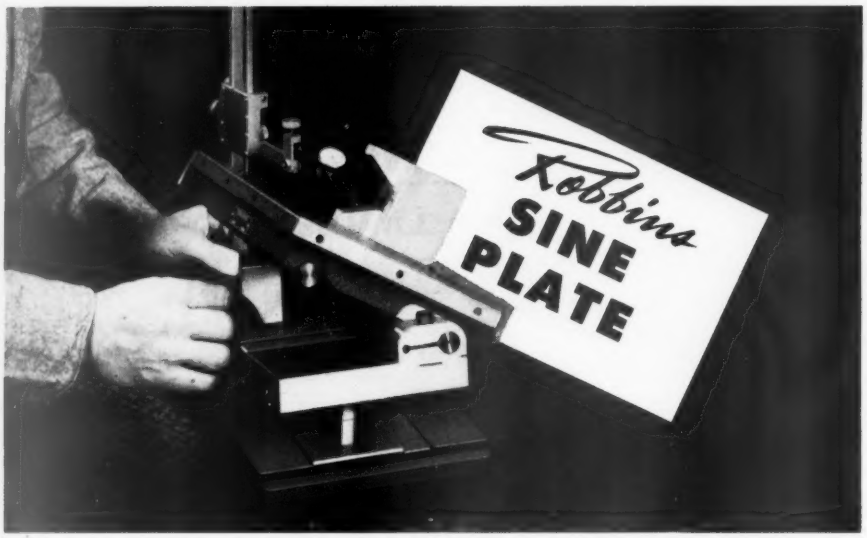
ASTM To Publish Directory Of Commercial & College Labs.

The "Directory of Commercial and College Laboratories", hitherto compiled and published by the National Bureau of Standards of the U. S. Department of Commerce, will be published in the future by the American Society for Testing Materials. First published in 1927, the Directory has been periodically revised. It provides information concerning the location of testing laboratories together with the types of commodities and the nature of the investigations the laboratories are prepared to undertake.

ASTM is now gathering data for the revised edition of the Directory. Every known testing laboratory will be requested to furnish information about its testing activities. Efforts will be made to reach laboratories not now listed through appropriate notices in the technical and business press.

The Directory is designed to be of assistance to the large number of purchasers who are not equipped to make their own acceptance tests and therefore have hesitated to buy on specifications. The knowledge that they can, at any time, call upon testing laboratories to check deliveries made to them on specifications should induce many purchasers to take full advantage of the specification method of buying. It will also be of value to small manufacturers and others who are seeking testing laboratory services in the evaluation of raw materials and finished products.

Until the revised ASTM Directory is completed, the present Directory, National Bureau of Standards Miscellaneous Publication M187, published in 1947, will continue to be available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.



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Sandpaper-Making Smoothed Out By Sonic Techniques

Two of industry's newest production aids — ultrasonics and electronics — have been harnessed to improve manufacturing of one of the oldest products, sandpaper.

The Carborundum Company reports ultrasonic waves, introduced into the adhesive mix, measure the sound-wave energy required to cause the layers of adhesive to slosh back and forth over one another. The energy is proportional to the viscosity of the mix. This is calculated by an electronic computer designed by Minneapolis-Honeywell engineers which feeds the data to a special electronic recording-controlling instrument, that automatically maintains the viscosity of the fluid at the proper level. If the mix becomes "heavy," the electronic instrument dilutes it just enough to bring it back to normal.

The result — an abrasive belt that can sensitively erase the newsprint from paper without damaging the paper itself, or hog out a quarter of an inch of aluminum in a single bite.

Clearing Machine Corp., recently announced the transfer of **George Herrick** to its Detroit sales office. Herrick has been in the press business since 1935. Previous to his recent assignment, he had been in charge of the Clearing office in Lansing, Mich.

George Herrick

◆

R. H. Christenson has been appointed sales and service representative of the Chemical Processing Division of the Detrex Corp. He will serve in the East-Central Region. Christenson is a graduate of Purdue University and holds a Metallurgical Engineering degree. He has been in the Chemical Processing Division of Detrex for two and one half years.

◆

Colonial Broach Company of Detroit has promoted **Glen Harmon,** present assistant chief engineer, to new top level engineering duties. The firm also announced the appointment of **Earl "Dutch" Clark,** former University of Detroit athletic director and football coach, as a Detroit area sales representative.

◆

The Ingersol Milling Machine Co. of Rockford, Ill., has appointed three new men to its staff of cutter and cutter grinder sales representatives and revised a number of territorial assignments, as follows: **Walter J. Mason,** Indiana and western Ohio; **Robert H. Harris,** Philadelphia and New York metropolitan areas; **Donald G. Brophy,** Eastern Ohio and western Pennsylvania; **D. L. S. McCoy,** Detroit area; and **Ralph W. Jensen,** central Michigan.

LARGEST INSTRUMENT EXPOSITION

The First International Instrument Exposition, sponsored by the Instrument Society of America, has already received contracts from 287 exhibitors for 573 exhibit booths at the Philadelphia Convention Hall, September 15th — 21st, 1954.

The Show increased its exhibit area from **10,000** sq. ft. in 1946 to 35,000 sq. ft. in 1953, and the exhibit area so far sold for the 1954 International Show in Philadelphia totals **57,000** sq. ft. The Show management has found it necessary to contract for additional space.

The attendance at the 1953 Instrument Conference and Exhibit was slightly over 11,000. More than 25,000 visitors from all parts of the country and many foreign countries are expected to attend the First International Instrument Congress & Exposition.

Further information may be obtained by writing the Managing Director, First International Instrument Congress and Exposition, 845 Ridge Avenue, Pittsburgh 12, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 135

Stainless Steel Production Hits Records in 1953

Stainless steel production figures for 1953 were an all-time high of 1,015,303 tons. These production figures are based on reports by 20 stainless steel producers, which in 1953 represented 97.1% of the total output of stainless steel ingots.

The tapping of 100% threads in the end of thin-wall aluminum tubing is reported to be much more efficient since the installation of a new Spray-Lube System at the Standard Tool and Machine Co. in St. Louis.

Previous to the installation, the tapping process was a time-consuming, messy operation. The cutting compound used was a mixture of ½ mineral oil, lard and turpentine and ½ industrial wax. It was applied to the tap by hand with a brush.

Now, manual lubrication has been eliminated and better tapping quality has been produced. The procedure is much cleaner and machine output has increased 35%.

100% Threads Tapped 35% Faster With New Spray Lube System

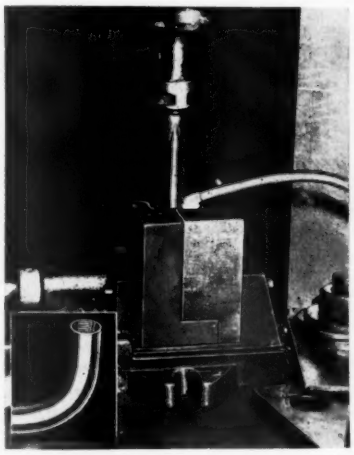

Photo courtesy of C. A. Norgren Co.

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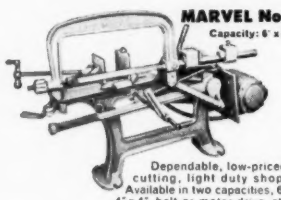
—ECONOMY, SPEED, VERSATILITY, CAPACITY

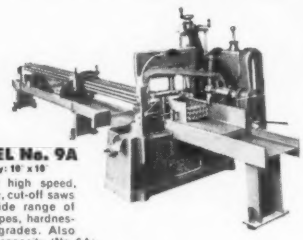
Whatever your individual requirements in metal-cutting equipment, MARVEL has it. MARVEL builds nine basic types of metal sawing machines, each available with a choice of modifications and special accessory equipment.

Your local MARVEL sawing engineer is competent to study your cut-off and metal sawing problems, and to make recommendations as to the most advanced methods and equipment.



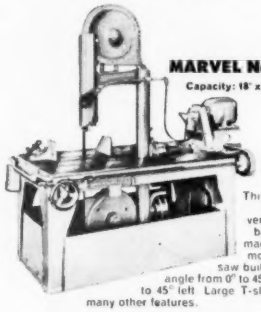
MARVEL No. 2/MI
Capacity: 6" x 6"

Dependable, low-priced, dry-cutting, light duty shop saws. Available in two capacities, 6" x 6" or 4" x 4", belt or motor drive, stationary or portable.



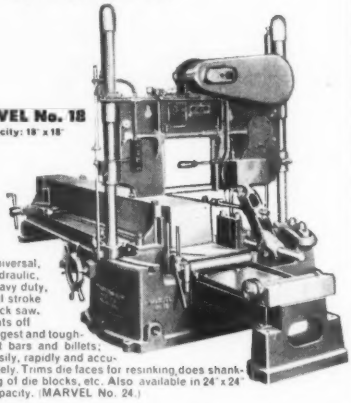
MARVEL No. 9A
Capacity: 10" x 10"

Automatic high speed, heavy duty, cut-off saws handle wide range of sizes, shapes, hardnesses and grades. Also with 6" x 6" capacity. (No. 6A) or in single cut types (No. 9, No. 6).



MARVEL No. 8
Capacity: 18" x 18"

This universal, advancing vertical blade, band sawing machine is the most versatile saw built. Cuts any angle from 0° to 45° right to 0° to 45° left. Large T-slot bed and many other features.



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Unbreakable composite saw blades with fastest-cutting, longest-lasting high speed steel edge integrally welded to a tough unbreakable body, permit maximum speeds and feeds on any hack sawing machine. Permit tauter tensioning—increases accuracy. Outlasts all other blades.
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CIRCLE INFORM-A-GRAM KEY NO. 136

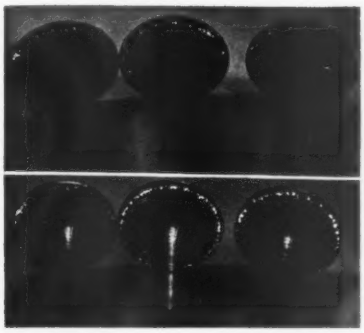
Employees Earn Record $159,600 For 1953 Ideas

In 1953 employees of the Westinghouse Electric Corporation earned a record-breaking $159,600 in suggestion awards—11% more than in 1952. Westinghouse men and women also set another high last year by submitting 29,206 ideas through the Company's employee suggestion system. Approximately one out of every three of those suggestions was accepted.

Last year, Westinghouse revised its suggestion system. Under the new plan, cash awards have been doubled. For an acceptable idea, an employee now receives 20% of net annual savings. Maximum award for a single suggestion is $15,000. Westinghouse employees have earned $1,830,000 in awards since the Company suggestions plan was instituted in 1910.

New Technique in Penetrant Inspection

A new scale of sensitivity in penetrant inspection is available in new fluorescent penetrant inspection materials. Named Zyglo-Penetrex, the new penetrant has been used in a long series of controlled field trials under its experimental name, PE or post-emulsification. Its first pilot use in volume was in the important inspection of gas turbine buckets.



These diesel valves, after refacing with high alloy welding, were okayed visually before being sent on for engineering inspection. Zyglo-Pentrex (bottom half of photo) was the only method that located the defects present.

Complete information is available from Magnaflux Corp., 7300 West Lawrence Avenue, Chicago 31, Illinois.

Surface Finish Process Licensed To U. S. Companies

A new German-developed electrochemical process, which produces a permanently brilliant surface finish on metal parts made of high purity aluminum, is now being licensed to metalworking and finishing plants in this country.

The process uses common and relatively inexpensive chemicals. While the current density during the brightening process is relatively high, the time required is only 30 to 60 seconds. Cost of all ingredients is very low, and the bath, when exhausted, can be rejuvenated by the addition of a single ingredient.

Brown & Sharpe Film Highlights Precision Machine Tool Building

The Brown & Sharpe Mfg. Co. announces the release of a new motion picture, entitled "Meet Brown & Sharpe", which illustrates interesting highlights in the operations of a multipleline precision machine tool and small tool builder. It traces the requirements in precision and in human endeavor required to build the "master tools of industry".

In color and with sound, this 16 mm film is available and appropriate for civic and engineering meetings, schools, etc. It may be obtained from any of the thirteen Brown & Sharpe offices located in principal cities in the U. S., or from the main office and plant at Providence, R. I.

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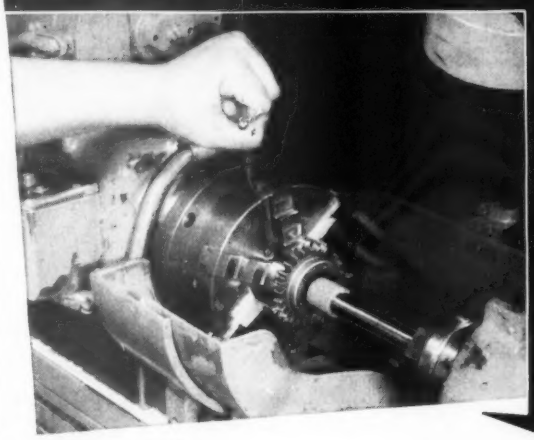

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Globe Gear Co., Royal Oak, Mich., makes this report. They use Buck 6"-6 jaw and Buck 6"-2 jaw Ajust-Tru Chucks on the Parker-Majestic Internal Grinder, South Bend Lathe and Monarch Lathe for drilling, boring, reaming.

On work held to .0005" precision they report a 30% saving of time compared to previous methods . . . 50% cost saving per operation . . . and 15% to 20% reduction in rejects.

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CIRCLE INFORM-A-GRAM KEY NO. 137

. . . Quality Capability, from page 43

To get a better picture of not only this spindle but all the other spindles, let us analyze what was occurring on all six spindles for Datum Dimension A, as shown in Figure 5.

Note that each spindle shows about the same variation of approximately 4 thousandths. However, note that Spindle No. 1 was averaging about 3 thousandths with a low of approximately 1 and a high slightly over 5. Table I indicates the condition of all spindles.

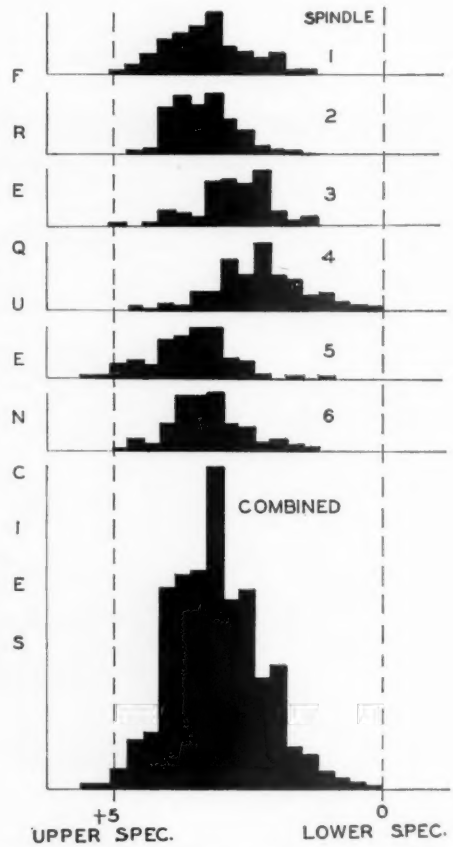

Fig. 5. Original condition of Datum Dimension A for all six spindles.

This indicated that each separate spindle was really capable of maintaining a variation in production which was within the blueprint tolerance since the six spindles actually had total spreads of from 3.5 to 4.8 thousandths. The difficulty was that these spindles were not being set so the average of each spindle was consistent with the others. Therefore, some were high and some were low, giving a much greater spread to the overall production of all six spindles. In fact, this overall spread in the sample of 100 pieces per spindle was 5.5 thousandths for all spindles. In addition to this, while we were taking this capability study we instructed the operators and jobsetters to carry on in their regular procedures. This resulted in a number of shutdowns for adjustment of certain spindles when the operators felt that they were in trouble. The spread or variation, within certain spindles, was thus exaggerated because of these adjustments.

A similar picture is presented by Datum Dimension B, Figure 6. Note that each spindle can maintain the same approximate variation as has been shown by Datum Dimension A, Figure 5. This is logical since the one form tool determines these two dimensions. This gives further credence to our analysis that each spindle in the machine can maintain approximately 3.5 to 4.8 thousandths.

The Preliminary Conclusion

The preliminary conclusion reached was that the machine could maintain specifications

. . . Continued on page 140

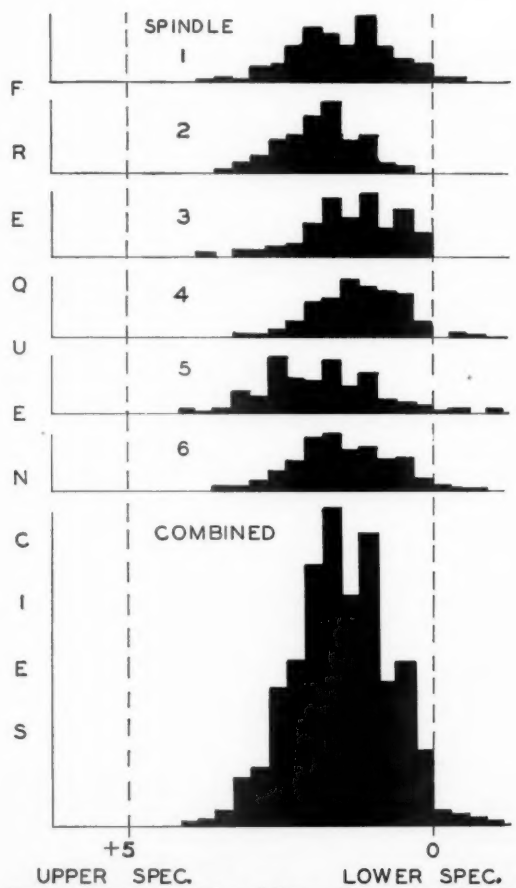

Fig. 6. Original condition of Datum Dimension B for all six spindles.

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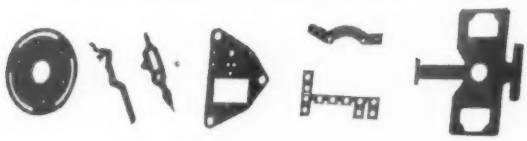

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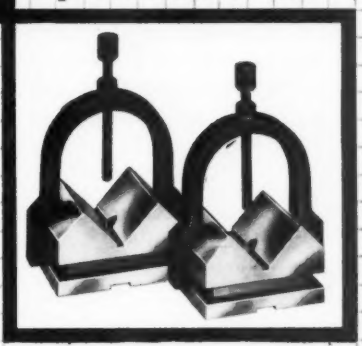

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. . . Quality Capability, from page 138
easily if the personnel could be trained to adjust the machine properly.

The Calculations of the Quality Capability Analysis

The Quality Capability Analysis is not based upon such cursory analysis of these histograms, however. They are merely an illustrative method of presenting the comparative picture. The Quality Capability Analysis is in fact based upon calculations concerned with the recorded data.

These calculations are used to analyze **not only** the variation which is seen in the histogram illustrations, Figures 5 and 6, but to determine within what limits of variation the machine is capable of producing. In other words, not only the present condition is revealed by the Capability Analysis but predictions can be made with a high degree of assurance concerning the variation that can be obtained from the machine in its present state of maintenance and repair if Quality Control procedures are instituted.

Let us return to Figure 2 in order to follow the calculations that are made in the Quality Capability Analysis. For purposes of brevity we will again only be concerned with Datum Dimension A on Spindle No. 1.

The Average and Range

First, the five consecutive pieces are totaled and recorded in the row marked "total." In this case this is 22.4. Then the average for these five pieces is calculated (4.48). This figure is called $\overline{X}$ (pronounced X Bar). The variation within the sample of five pieces is calculated as the Range (R). This is the lowest reading (3.8) subtracted from the highest reading (5.2) in each sample of five pieces.

$R = 5.2 - 3.8 = 1.4$ (the range of the first five data)

The Average ($\overline{X}$) and Range (R) are calculated for each sample of five pieces. This would give us 20 Averages and 20 Ranges for each spindle in the sample 100 pieces per spindle.

The Grand Average (called $\overline{\overline{X}}$ — pronounced X Double Bar) is then calculated according to the following formula:

$$\overline{\overline{X}} = \frac{\text{Sum of } \overline{X}\text{'s}}{\text{No. of } \overline{X}\text{'s}} = \frac{61.0}{20} = 3.05$$

and the Average Range ($\overline{R}$ — pronounced R Bar) is calculated:

$$\overline{R} = \frac{\text{Sum of R's}}{\text{No. of R's}} = \frac{24}{20} = 1.2$$

The above calculations indicate that our data for Datum Dimension A Spindle No. 1 showed a Grand Average ($\overline{\overline{X}}$) of 3.05 and an Average Range ($\overline{R}$) of 1.2.

The $\overline{X}$ and R Chart

The averages and ranges for the 20 samples of five are plotted on a control chart which is called an $\overline{X}$ and R Chart (pronounced X Bar and R Chart). For the purposes of this analysis the chart indicates the type of control (or lack of same) which the operation has at present. The chart is usually used, however, to aid the production people in gaining closer control of the machine or operation and we will illustrate this phase later in the article.

Analyzing the Range

Our greatest interest in the chart at this point is in the analysis of the Range Chart. As we can see from the calculations to this point, the range is a measure of the variation that exists from piece to piece or what is called moment to moment variation. This gives us an indication of the dimensional variation which the machine is capable of maintaining. We now have to test whether the variation in the sample ranges is what is normally expected by chance, reflecting a machine basically sound without a serious fault in performance (such as worn bearings, chipped cutting tool, etc.). If a serious fault did exist in the machine, this would be indicated by an abnormal amount of variation from piece to piece (excessive variation in ranges). This would reflect an abnormal situation, with no ability to control dimensional variation on this operation.

In order to test this machine capability for control in ranges, we must use the following formula:

Upper control limit for Range (UCL_R) $= D_4\overline{R}$

$\overline{\overline{R}}$ is calculated from the data as we have shown.
D_4 is a constant which may be obtained from any Quality Control text. Some references are cited at the end of this article.

The UCL_R (upper control limit for R) denotes the maximum range which is normally expected in the data if controlled variation in this dimension can be realized from this machine. In our case the calculations for Datum Dimension A Spindle No. 1 were as follows:

. . . Continued on page 142

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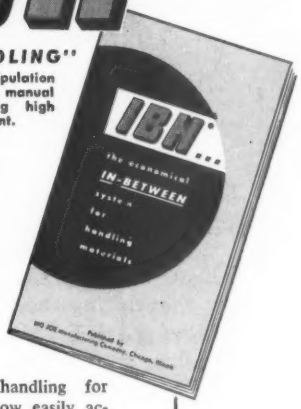

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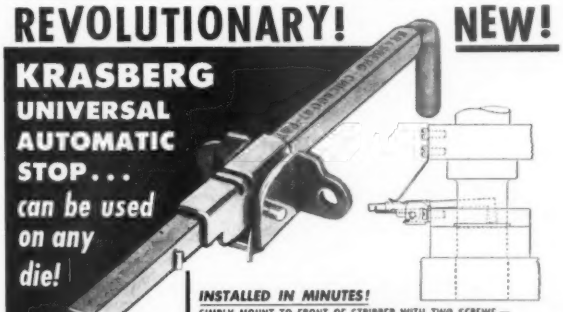

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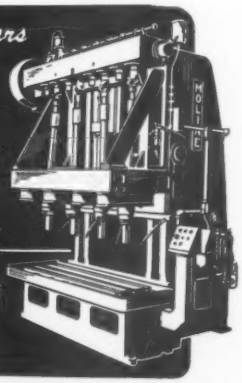

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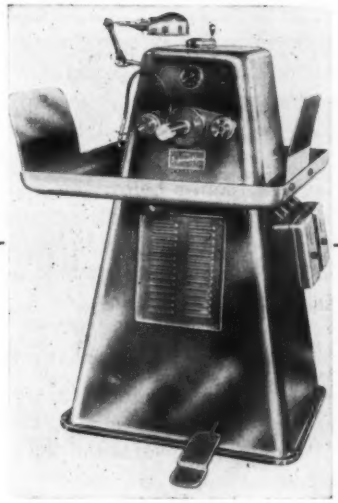

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. . . Quality Capability, from page 140

$$UCL_R = D_4\overline{R}$$
$$= 2.11 \times 1.2$$
$$= 2.54$$

If the ranges are not lower than the UCL_R calculated, this indicates that there is something basically wrong with the machines, such as poor alignment of tooling, bearing troubles, chipped cutter, etc. Under these conditions no predictions can be made concerning the machine in its present state of maintenance and repair, and assured dimensional control is unattainable until these faults in the machine are removed. It has been the author's experience that when this is pointed out to maintenance engineers and mechanics, they can usually find the trouble and correct the fault which the uncontrolled range indicates. Note carefully — the chart doesn't tell you what is wrong; only that something is wrong.

In our case, however, the Datum Dimension A on Spindle No. 1 did show control in the range with all points below the upper control limit (UCL_R). Similarly, all spindles showed this controlled range. Moreover, Datum Dimension B on all spindles indicated a controlled range as well.

Calculating the Total Variation Expected

Once we had determined that the ranges were in control, we were able to calculate the limits of dimensional variation which the machine could maintain. In order to do this we first must calculate the range, from which we can estimate the standard deviation (σ) as follows:

$$\sigma = \frac{\overline{R}}{d_2}$$

$\overline{R}$ is known from the above calculation

d_2 is a constant found in any of the references cited

In our case:

$$\sigma = \frac{\overline{R}}{d_2} = \frac{1.2}{2.326} = .52$$

Now we are ready to calculate the Quality Capability of this spindle. The total expected variation in the process if it were under control would be six times σ and in our case

$$6\ \sigma = 6 \times .52 = 3.12$$

Applying This to Our Check on Spindle No. 1

In other words, the total variation which this spindle is capable of maintaining is 3.12 thousandths of an inch. This is somewhat less than the histogram showed but the reader must remember that during the time the capability study was being taken the jobsetter had been adjusting this spindle which caused even greater variation in our sample. This calculation confirms our preliminary assumption that this spindle can easily maintain the tolerance on this operation if Quality Control procedures are instituted.

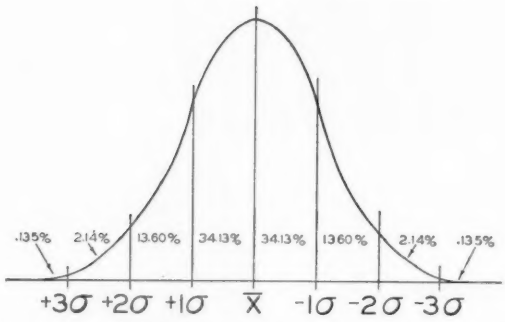

Fig. 7. The Normal Curve of Probability (Gaussian Curve).

The Normal Curve of Probability

We can also calculate the distribution of measurements which will result from this operation. Until now we have indicated thru the histograms, Figures 5 and 6, the distribution of sample values. If Quality Controls are instituted, the distribution of values would approach the Normal Curve of Probability or the so-called Gaussian Curve, Figure 7.

In order to understand better what this illustration of the normal curve of probability means, Table II is presented to show how, according to the normal curve of probability, the values will be distributed.

TABLE II

34.13% of the values will be between $\overline{\overline{X}}$ and + 1 σ
34.13% of the values will be between $\overline{\overline{X}}$ and — 1 σ
13.60% of the values will be between + 1 σ and + 2 σ
13.60% of the values will be between — 1 σ and — 2 σ
2.14% of the values will be between + 2 σ and + 3 σ
0.135% of the values will be above + 3 σ
0.135% of the values will be below — 3 σ

Applying the Normal Curve of Probability to Datum Dimension A, Spindle No. 1

To illustrate what this means concerning Datum Dimension A, if our jobsetter had not adjusted Spindle No. 1 during the time we collected the data and the average setting was 3.05, the 100 pieces would probably have varied according to the pattern shown in Figure 8

. . . Continued on page 144

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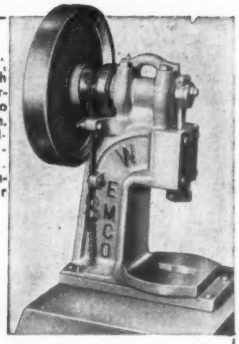

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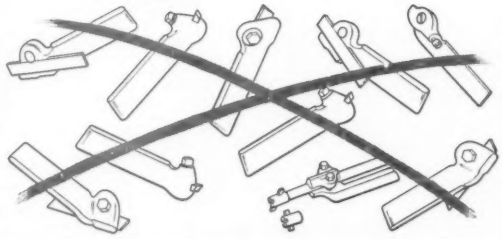

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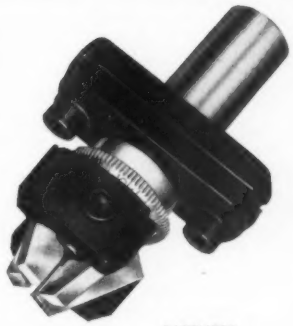

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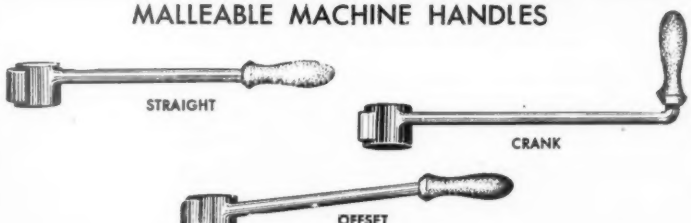

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. . . Quality Capability, from page 142

which is obtained by applying the normal curve of probability, Figure 7, to our situation.

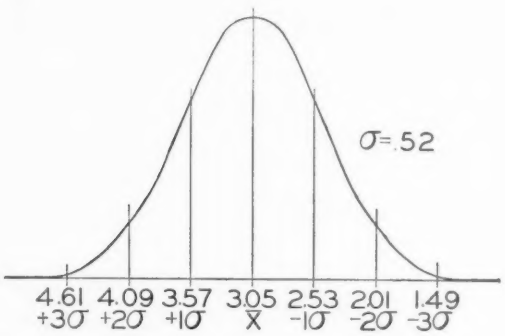

Fig. 8. Application of normal curve of probability to Datum Dimension A, Spindle No. 1.

To understand how we obtained Figure 8, let us continue our calculations on Datum Dimension A for Spindle No. 1. Our figures would apply to Table II as follows:

$$\overline{\overline{X}} = 3.05$$
$$1\ \sigma = .52$$
$$\overline{\overline{X}} + 1\ \sigma = 3.57$$

Therefore, we can anticipate that approximately 34.13% of our pieces would measure between 3.05 and 3.57 ($\overline{\overline{X}}$ and $+ 1\ \sigma$). Calculations similar to these would result in the figures shown in Table III which merely tabulates the facts as presented in Figure 8.

TABLE III

If Spindle No. 1 had not been adjusted during the time the Quality Capability Analysis had been taken, the distribution of values would probably have varied as follows:

34.13% of the values would be between 3.05 and 3.57

34.13% of the values would be between 3.05 and 2.53

13.60% of the values would be between 3.57 and 4.09

13.60% of the values would be between 2.53 and 2.01

2.14% of the values would be between 4.09 and 4.61

2.14% of the values would be between 2.01 and 1.49

0.135% of the values would be above 4.61

0.135% of the values would be below 1.49

Practical Limits of Variation

The reader will note that the total variation expected has been stated previously as 6 σ. This would be $\pm$ 3 σ. Tables II and III indicate, however, that .135% + .135% or .270% would be beyond the 3 σ limits of expected values. What about this .27%? Quality Control practice considers the practical limits of variation to be $\pm 3\ \sigma$ and to neglect the extremely small amount expected out of these limits (.27%). Of course, should certain critical dimensions demand closer compliance than this, those expected outside of these 3 σ limits would have to be taken into account in any calculations concerning a process.

TABLE IV

Areas	Percent of Production Expected To Fall Within Values
1. Between 3.05 and 5.0	49.98+%
2. Between 3.05 and 0	49.9999+%
3. Above 5.0	Less than .02%
4. Below 0	Insignificant
5. Total within spec. (1 + 2)	99.98+%
6. Total out of spec. (3 + 4)	Less than .02%

How Much in Specification?

The next logical question would be, "Since we know these factors and can predict what the distribution of our values should be, can we tell what percent of values can be predicted to be within specifications?" The answer is yes. In fact, this is one of the most valuable uses of the probability thinking and the characteristics of the normal curve which we apply to the Quality Capability Analysis.

Again using Datum Dimension A Spindle No. 1, we can calculate the percent expected within specification as follows (see Figure 9):

$$\frac{\text{Upper spec.} - \overline{\overline{X}}}{\sigma} = \frac{5 - 3.05}{.52}$$

$$= \frac{1.95}{.52} = 3.75 = t$$

Referring to any table of areas under the normal curve (see references cited) t = 3.75 is equivalent to 49.98+% of the area from $\overline{\overline{X}}$ to this t value in the normal curve. This means that 49.98+% of our values would have come

. . . Continued on page 146

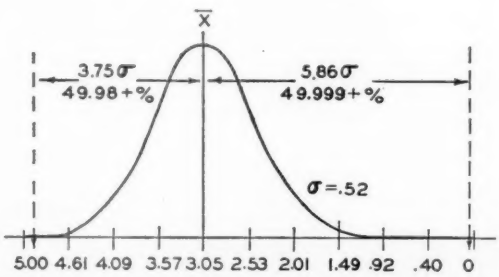

Fig. 9. Percent expected within specification, Datum Dimension A, Spindle No. 1.

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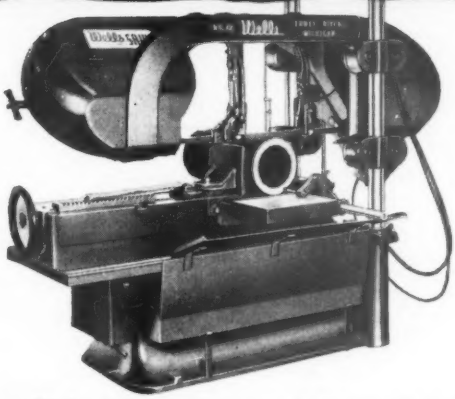

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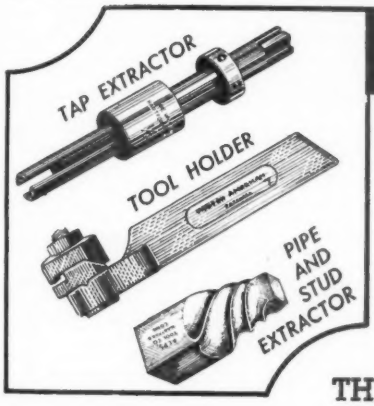

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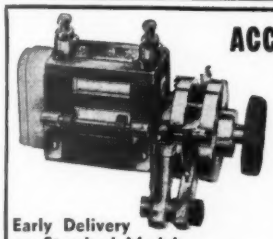

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. . . Quality Capability, from page 144

between 3.05 and 5.0 ($\overline{\overline{X}}$ and the upper spec.).

Similar calculations were made to determine the percent within specifications for Datum Dimension A, Spindle No. 1. The results were as shown in Table IV.

Incidentally, note that although the llustration shows a finite limit for the normal curve, these lines actually reach infinity.

Using the same methods we are able to calculate the out of specification percentages expected for each spindle and each dimension at the time of collecting the data, had there been no adjustment of the spindles during the study. These calculations show that less than 0.1% of the values should be out of specification.

Effect of Machine Adjustments on Variation

There is much less out of specification calculated than was actually shown in the capability study which showed approximately 3% out of specification. The history of the part based on 100% inspection showed an even worse situation with about 5% rejected for out of specification on this characteristic. In order to understand why the calculated showed less out of specification than the actual test and why the test showed less than the 100% inspection revealed, it is necessary to understand what happens when adjustments are made in the machine.

Referring again to Datum Dimension A Spindle No. 1, let us illustrate why the calculated expected variation was from 1.49 to 4.61 (Table III) while the actual variation was from 1.0 to 5.2. When adjustments are made in average settings, as the jobsetter had done in this case by adjusting the stop, the overall ability of the machine to control variation is not impaired and the actual variation (the maximum reading minus the minimum reading) does not change appreciably. The average reading, however, will change during these adjustments.

Figure 10 is included to explain these effects. Note that the illustration is not factual but merely representative of the changes involved. The middle curve represents the approximate situation which caused the maximum readings of 5.2. At this point the average setting was 3.6 and the low was 2.1.

Similarly, the upper curve represents the approximate situation which caused the minimum reading of 1.0. The average setting was 2.5 and the high was 4.1.

Constant setting, resetting, and tool wear caused the narrower curves to roam back and forth between the limits indicated by these two curves to form the wider distribution (1.0 to 5.2) which we found in the Quality Capability Analysis and is graphically represented in Figure 10 as the lower curve.

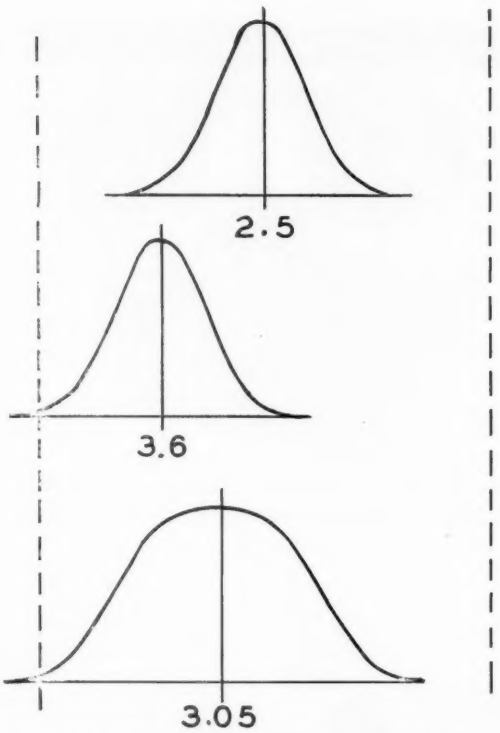

Fig. 10. Effect of changing machine adjustments.

This is representative of Datum Dimension A only, and one must realize that there were constant adjustments by the jobsetter of all the other spindles and that this accounted for the increased variation found on each spindle as compared to the calculated variation which was premised on the fact that Quality Controls would have to be instituted. Realize also that even though this study only shows 3% out of specification, constant adjustments would further exaggerate this inability to control.

It would be highly unlikely that our check which only involved a few hours' time in comparison to the long history of this part would expose the worst situation that had occurred. Our 100% inspection history of the part corroborates this conclusion since approximately 5% of the parts had been rejected for this dimension.

(To be Continued)

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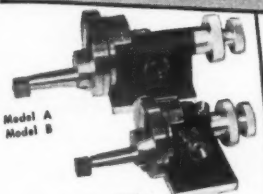

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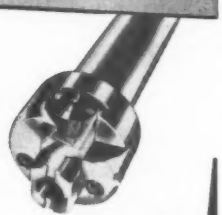

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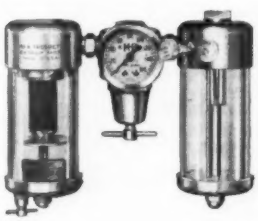

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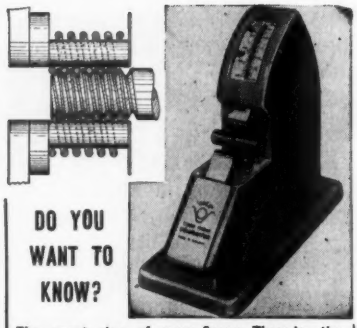

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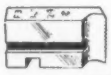

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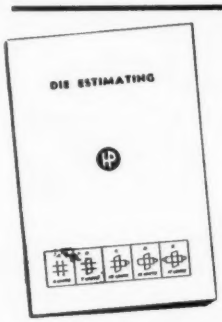

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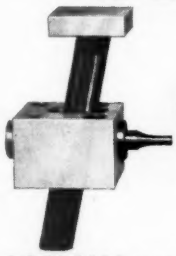

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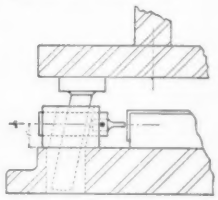

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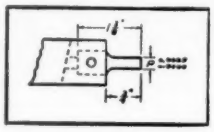

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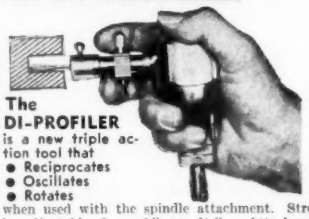

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The library also maintains a complete file of specifications issued by the U. S. Government including standards of the Federal Supply Service (the Federal Specification Board), Department of Defense, Simplified Practice Recommendations, and some documents of state regulatory bodies concerned with safety.

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Gray Iron Founders' Society has launched its 1954 Gray Iron Castings Redesign Contest.

This annual contest, now in its fifth year, offers cash awards of $500, $250 and $100 for the three top places in the contest.

The purpose of the contest is to encourage more extensive use of gray iron in products formerly manufactured by a competitive process. Prize winning entries are used by the Society as authentic case histories in the production of its national advertising series which stresses the economy and performance of gray iron as an engineering material.

All entries in the competition must be submitted to the headquarters' office, National City East Sixth Building, Cleveland, Ohio, by June 1, 1954. After review by the G. I. F. S. Advertising Committee, presentations of awards will be made at the Society's 26th Annual Meeting at The Homestead, Hot Springs, Virginia, in November. The contest is open to all persons engaged in the metalworking trades; entries may be entered jointly by two or more individuals.

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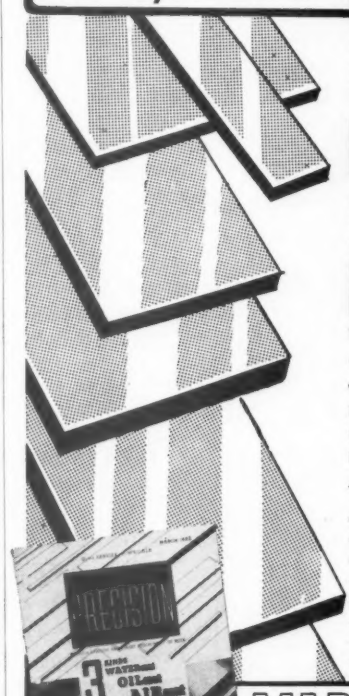

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. . . Maintenance, from page 47

Fig. 5. Method for setting spindle bearings to proper torque as shown in chart.

spindle so that the spindle can be turned with a socket and torque wrench, Figure 5. With the spindle in neutral, the following foot-pounds should be required to **start** the spindle rotating:

Bar Capacity	Maximum Spindle Speed	Foot-Pounds
1	800	3-4
1-1⅛	1500	1½-2
1-1⅛	1800	1-1½
1-1⅛	2000	¾-1
2	800	4-6
2	1600	2-3
2½	700	4-6
2½	1400	2-3
3	500	5-8
3	1000	2-4
3½	500	10-15
3½	1000	5-7
4½-6	350	20-25
4½-6	650	10-12
8-12	225	30-40
8-10	425	15-20
8-10	725	7-10

The above settings apply to tapered roller bearing spindles only.

Under certain conditions, deviations from the above settings are permissible. However, we suggest that the manufacturer be consulted for instructions.

After making the above adjustment, the spindle should be rotated slowly by hand. If roughness is felt, bearings should be replaced.

Another major factor contributing to the accuracy of machines is the proper fit of the lock bolts in the square and hex turrets. These should be checked periodically for any looseness. If they show wear, they should be replaced together with the lock bolt sleeve and spring. In replacing the lock bolts, the proper procedure is to drive out the old lock bolt sleeve, following instructions in the service manual, and drive the new sleeve in place. This sleeve should then be lapped out, Figure 6, until the new lock bolt can be inserted with a light push. The bushings under the hex turret and square turret can be removed with the proper size socket head cap screw and turned 90° to bring a new locating surface into position.

Overloading of machines and electrical equipment is a contributing factor to shortening the life of the machine and can be controlled simply and inexpensively by the use of a small ammeter in view of the operator. By experimenting with various tool grinds, feeds and speeds the optimum load can be determined for ideal conditions and when this load increases appreciably, the operator has visual evidence that the tool is in need of regrinding or some other factor is causing an overloading of the machine. The Detroit Milling Cutter Co's. load meter can be calibrated for your particular requirements.

A frequently overlooked part of the machine is the V-belt drive which should be checked monthly for proper adjustment. Belts should be adjusted so that at a point midway between the sheaves, each belt can be depressed with the finger approximately 1 to 1½", depending upon the distance between the sheaves. If any belts are worn, the whole group should be replaced with a matched set.

On saddle type machines, the setting of the rapid traverse clutches should be checked at least once a month to prevent wear caused by looseness.

The setting of apron clutches should be checked at least every two weeks to assure proper feed of the cutting tools. Friction clutches should be set so that they will release in the event of accidental overload to protect the gear train in the aprons. Positive tooth clutches as found in modern saddle type machines should be kept tight to prevent breaking of the fine teeth. On the more recent saddle type machines, a safety clutch is installed in the apron to prevent breakage of the apron mechanisms in the event of an accident. Contact the manufacturer's representative if you are not certain

. . . *Continued on page 154*

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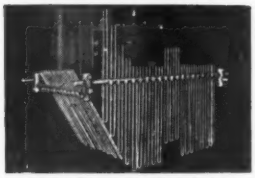

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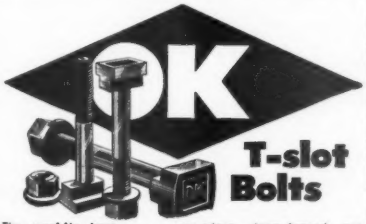

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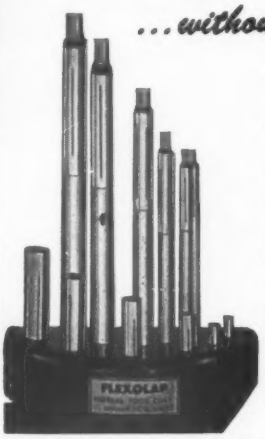

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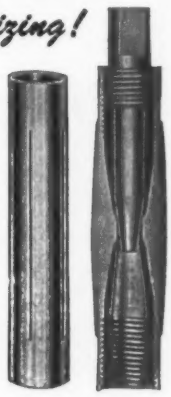

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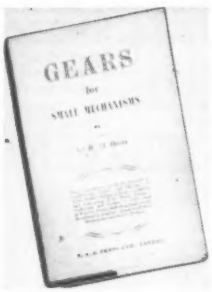

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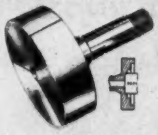

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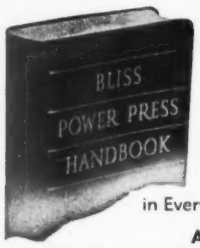

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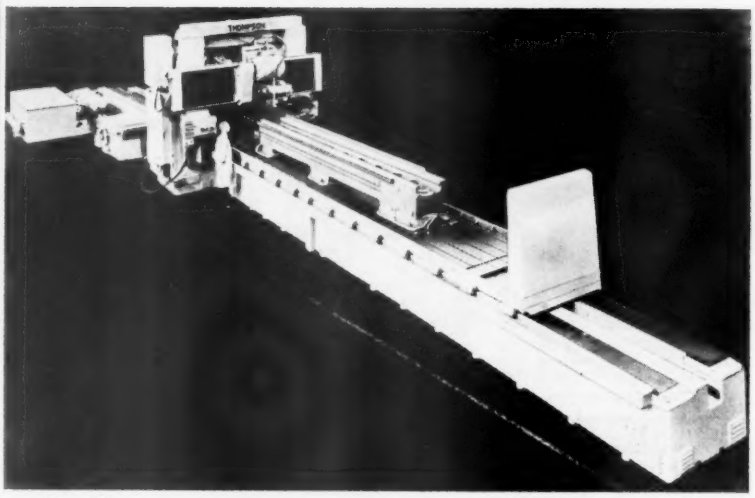

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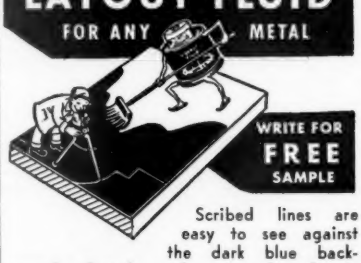

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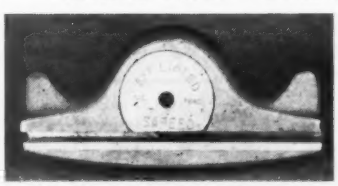

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. . . Maintenance, from page 150

that your equipment has a safety clutch.

At least once a month you should check the level of your machines with a good spirit level reading .0005 per foot per graduation. Levelling instructions are contained in the service manual for your particular machine and should be followed closely.

The following chart will assist you in keeping your turret lathes at their level best.

PREVENTIVE MAINTENANCE SCHEDULE

Daily

Oil all lock bolts.
Check oil levels in all reservoirs.
Grease coolant pump fittings.
Fill oil cups to apron worms.
Oil cross slide and hex turret slide.
Oil carriage apron stop roll.
Grease geared scroll chucks.

Weekly

Grease all fittings.
Check adjustment of all clutches.
Check oil level in head-stock reservoir.
Check and drain oil filter.
Clean exterior of machine with kerosene and rags.
Check adjustment of hex turret binder clamp.
Check adjustment of all gibs.

Monthly

Check machine for level and alignment.
Align bar feed.
Check tension and condition of V belts.
Clean out coolant reservoir and screen.
Dis-assemble and clean chucks.

Quarterly

Dismantle ram and saddle unit and clean out all chips and sludge.
Check lock bolts and replace, together with sleeve and spring, if necessary.
Clean or replace all felt and leather wipers.

Semi-Annually

Drain and clean oil filter.
Drain, clean and refill head stock reservoir.
Check adjustment of center bearing in hex turret. (Turret should rise approximately .0015" when unclamped.)
Check adjustment of spindle bearings.
Drain, clean and refill all oil reservoirs.
Remove bottom pan from aprons and clean out chips and sludge.
Drain and clean oil filter.

In the foregoing we have only hit the high spots on setting up a preventive maintenance schedule for your machines and we suggest that you contact the manufacturer of your machine for further information, or refer to the Warner and Swasey booklet entitled "How To Take Care of Your Turret Lathe".

Fig. 6. After driving in new lock bolt sleeve, it must be lapped out in place until the new lock bolt enters with a light push fit.

In summing up, the main thing to remember is that cleanliness is the most important factor in maintaining the accuracy and productivity of your machines. If the slide tightens up, don't loosen the gibs; take the slide off and clean it out. Don't use an air hose to clean off the machine; use a brush. Keep all clutches set properly and keep clutches in balance. Don't operate cutting tools until they break. Keep them sharp and cutting freely and the machine will have long life. Check the level of the machine frequently and follow the procedure recommended by the manufacturer.

Actually, if you disregard the above, our business should be even better than it is; but, being lovers of fine machinery we sincerely hope that you won't. If you can get your operators to regard their machines as highly as they do their new "supersonic eights", you will not have any trouble keeping them in shape for a long, long time.

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CIRCLE INFORM-A-GRAM KEY NO. 156

Denison Announces Hydraulic Scholarship Fund

The man power situation in all fields of engineering has been a severe handicap to many firms during recent years, but those in specialized fields such as hydraulic have had an even tougher time than many.

As a spark-plug move to help break the back of this critical situation, a scholarship award plan to "foster interest in the rapidly expanding field of industrial hydraulics" has been announced by W. C. Denison, president and chairman of the board of the Denison Engineering Company, manufacturer of hydraulic presses and components.

The annual award is under the auspices of the William C. Denison, Jr. Foundation, and will be awarded annually to one or more graduates of Franklin County (Columbus, Ohio) high schools with the possibility of a second award being available to a graduating student with a parent in the employ of the Denison company.

Applicants must be under 25 years of age, residents of Franklin County and have maintained a scholastic average in the upper one-third of their graduating class. Selection of winners is in the hands of an awards committee, which this year is composed of Glenn A. Rich, School Supervisor for the Ohio Department of Education; Dr. Clyde E. Williams, Director of Battelle Memorial Institute; and William E. Taylor, Executive Secretary of the Columbus Industrial Association.

Winners have a choice of colleges, but they are to select a course of studies in hydraulics, or in engineering with special emphasis on hydraulics.

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by

Paul Grodzinski

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784 pages — 93 working tables — Over 486 photographs and drawings

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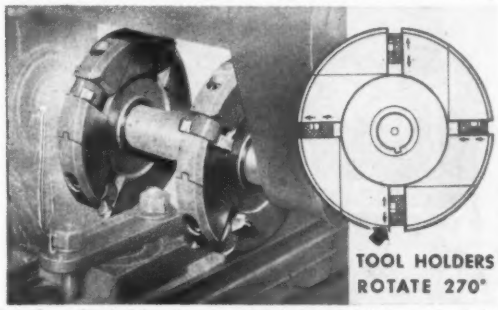
UNIVERSAL FLY CUTTER

Utilizing standard high speed steel or carbide bits, a single New-Field Universal fly cutter reportedly does the work of many special cutters.

Versatile in application, this tool is used for slotting, straddle and form milling, boring, flat surface milling.



It also is adaptable for machining plastics and light metals as well as steel or horizontal and vertical mills and drill presses. For further details write to New-Field Machined Parts Co., 210 7th St., Los Angeles 14, Calif., or— **Circle Inform-A-Gram Key No. D4.**

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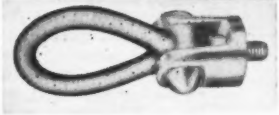

R. H. FROOM & COMPANY
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CIRCLE INFORM-A-GRAM KEY NO. 157D

. . . Plastic Die, from page 84

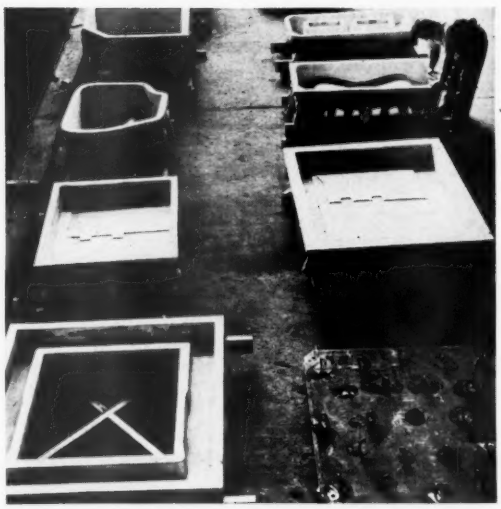
bubbles, the entire unit is placed in an oven and baked at a temperature of 180°. Actually, the inside temperature of the material is much higher because of the chemical reaction in the resin. In other words, it practically cooks itself.

After the die is taken from the oven, the plaster cast is removed and the die is smoothed and polished by hand with fine sandpaper. To the inexperienced eye, the die appears fragile, but actually it is harder than a rock and is capable of taking a tremendous pounding.

Plastic dies do not always last as long as steel ones; but due to the ease with which they may be made, they will be ideal for short production runs. They also have the advantage of being easily repaired with a plastic patching medium.

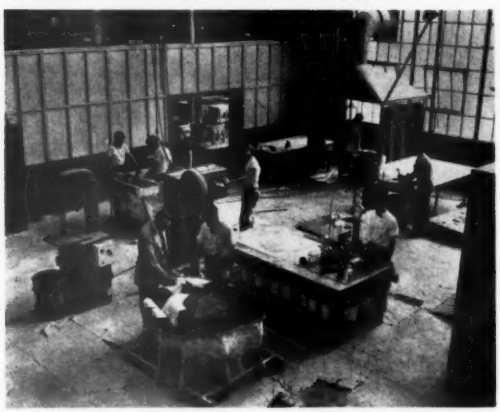
While Chrysler executives and plastic experts are reluctant to make predictions regarding the effects of this revolutionary process, some of the benefits are apparent. For example, frequent changes in car styling will now be possible on low production models. Another possible result of this new process is that the cost of sports cars and luxury models may be reduced. It may mean, too, that the customers of the future will have a greater variety of car styles to choose from in each line of cars.

A workman puts the finishing touches on a completed plastic die by going over it with sandpaper. Even though this is a large die, it looks deceptively fragile. If struck hard with a sharp hammer a dent will appear, but this will disappear without the trace of a scratch in a few minutes. Dies such as these can be made in a fraction of the time and at a fraction of the cost of conventional steel dies. Should the die be chipped it can be repaired easily and quickly with a plastic patching medium. The steel weldment on which the die is mounted is simply used to fit the die into the press.

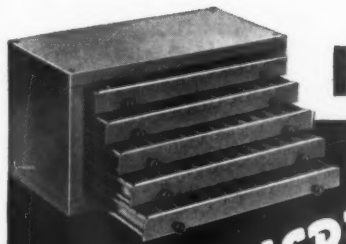


Plaster casts which are used for moulds for plastic dies wait their turn outside the die "kitchen" where the Chrysler Corporation's plastic dies are made. In the right foreground is a weldment that will be attached to the die so that it may be fitted to the die press.

Sheets of steel, called "blanks," are fed into a 600-ton press in which plastic dies are mounted.



Hidden for many months in a remote corner of one of Chrysler Corporation's many Detroit plants, this plastic die shop developed and perfected the new plastic dies. In the foreground, John Koons, head of the laboratory, explains to Syl Pingel, a die shop foreman, how glass cloth is placed in the plaster mold. In the left background men are removing the plaster cast from a plastic die. Other men are shown mixing chemicals, preparing weldments, and smoothing plaster molds.



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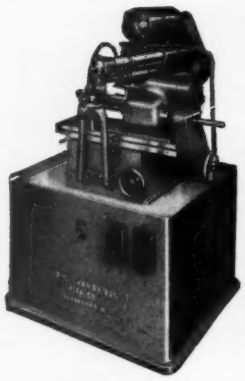
CIRCLE INFORM-A-GRAM KEY NO. 159C

Correction . . .

Featured in an interesting 3-page article published in the April issue of TOOLING and PRODUCTION was the Seneca Falls Machine Co.'s development of methods and equipment for automating the processing of work held between lathe centers. Unfortunately, an error was made in the title on page 205. The title should have read "Automatically Loaded and Unloaded for High Production."



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Drop-forged model with chrome finished micrometer head, from $9.25 up. Ask for Micrometer Catalog

No. 901 C 0-1" Size with LOCK NUT and RATCHET and 10th vernier as shown $13.25

This tool with TUNGSTEN CARBIDE tipped anvils $15.75

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CIRCLE INFORM-A-GRAM KEY NO. 160C

CROSS OFFICIAL IS NAMED U.S. ADVISOR

Ralph E. Cross, executive vice president of the Cross Co., Detroit machine tool builders, has been named technical advisor for the United States during overseas conferences on control of strategic materials.

Mr. Cross is now in London conferring with British authorities on proposals for revising the list of strategic materials involved in foreign trade. The revisions are being made in the light of modern technological developments which in some instances may alter the status of commodities on the present list as compiled some years ago.

On completion of his work in London, Mr. Cross will go to Paris to carry on similar conferences there.

The appointment of Mr. Cross to the Foreign Operations Administration is supplementary to his duties as director of the Metalworking Equipment Division, Business and Defense Administration, U. S. Department of Commerce.

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NO OTHER GAUGE COMPARES FOR FAST, ACCURATE LAYOUT AND MEASURING

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Capacities to 6" when used with this Fairfield Gauge 3" Riser

The Micro-Height Gauge is a precision instrument, finished in satin chrome, which reads like a micrometer and measures from zero at base to 3" in thousandths.

Use as a scriber for fast layout, or insert dial indicator for quick, accurate inspection.

Toolmakers, Layout men, and Inspectors do better work faster with Micro-Height Gauge.

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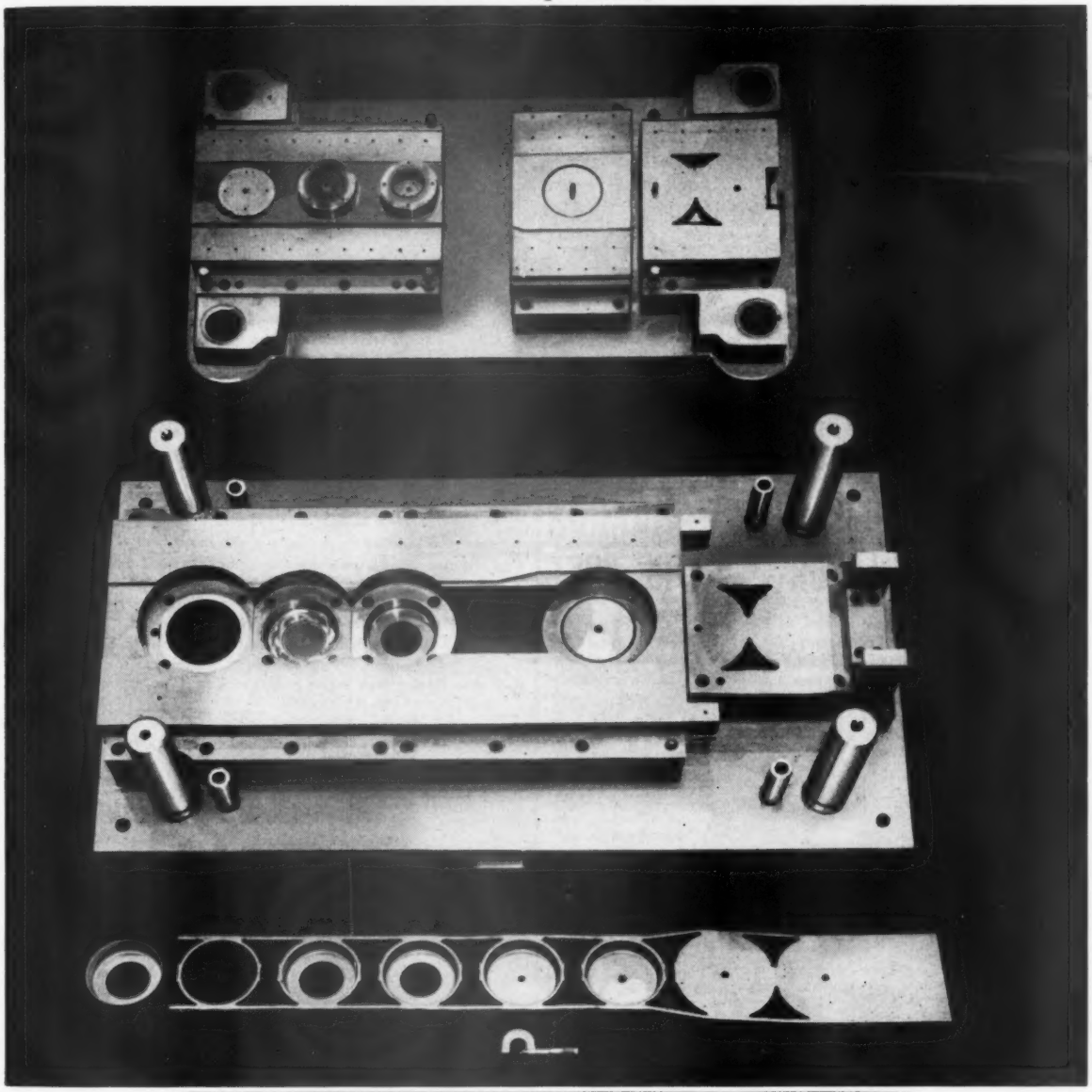

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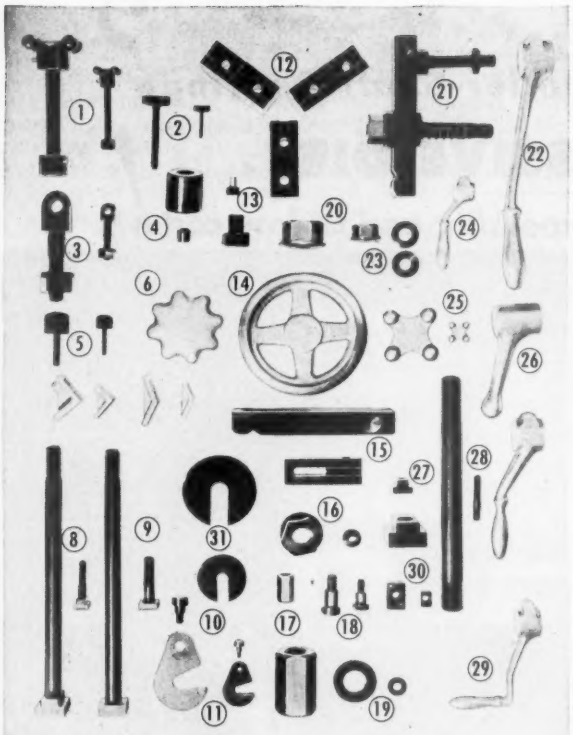

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2. Thumb Screws—4 sizes—3 lengths each size.
3. Latch Screws—4 sizes—hardened.
4. Jig Rest Buttons—4 sizes—hardened—ground.
5. Quarter Turn Screws—9 sizes—soft steel.
6. Palm Grip Hand Knobs—with reamed, tapped, or square hole.
8. Tee Slot Bolts—standard sizes ⅜" to 1"—various lengths.
9. Tee Bolts—standard sizes ½" to ¾"—various lengths.
10. Shoulder Screws—for use with swing "C" washer.
11. Swing "C" Washers—4 sizes—comes with shoulder screw.
12. Blank Soft Chuck Jaws—19 standard sizes—S.A.E. 1020 Steel—in stock to fit approximately 273 master chucks at a moment's notice—special blanks made on request.
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14. Hand Wheels—4 sizes 6" to 12" in diameter—aluminum alloy.
15. Strap Clamps—hard and soft—plain or with radius.
16. Flange Nuts—9 sizes—hardened.
17. Extension Nut Couplers—8 sizes—alloy steel.
18. Shoulder Screws—24 sizes—Hex head socket—160,000 to 180,000 P.S.I.
19. Plain Flat Washers—8 sizes—hardened—ground.
20. Spherical Flange Nuts—9 sizes—hardened—ground.
21. Strap Clamp Assemblies—comes with spherical flanged nut assembly or hand knob for clamping the strap.
22. & 24. Offset Handles—aluminum alloy or malleable casting.
23. Spherical Washers—hardened—ground.
25. Hand Knobs—aluminum alloy casting.
26. Clamping Levers—aluminum alloy or malleable casting.
27. Tee Nuts—14 sizes—hardened.
28. Studs—stress-proof steel.
29. Crank Handles—aluminum alloy or malleable casting.
30. Fixture Keys—(hard or soft)—ground.
31. "C" Washers—22 sizes—4, 5, and 6 diameters each size—ground.

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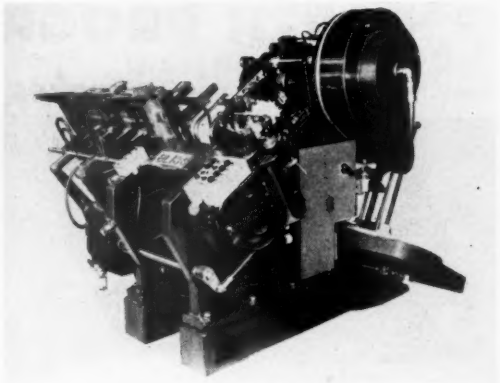
CIRCLE INFORM-A-GRAM KEY NO. 162

NEW STRIP FEED PRESS OPERATES AT 300 SPM



Photos courtesy E. W. Bliss Co.

Fig. 1. At the Canners Show recently held in Atlantic City a completely-new automatic strip feed press was exhibited for the first time. The press, which is used to produce sanitary can ends and closures was designed from the group up for high-speed operation. In long test runs at the manufacturer's plant, the press has operated satisfactorily at speeds beyond 300 strokes per minute. The following features have been included in the design to facilitate continuous operation at high speed and to minimize vibration and maintenance:

Combination disc friction clutch and brake electrically controlled, permits instant starting.

Balanced crankshaft minimizes vibration.

Feed bar driven positively by crank instead of lever, has adjustable fingers. The first bar is adjustable for all sizes without removal.

Idle stroke between strips has been eliminated.

Bolster area has been increased to 17" front to back x 16" left to right.

Press timing has been arranged for slide to stop automatically at top of stroke.

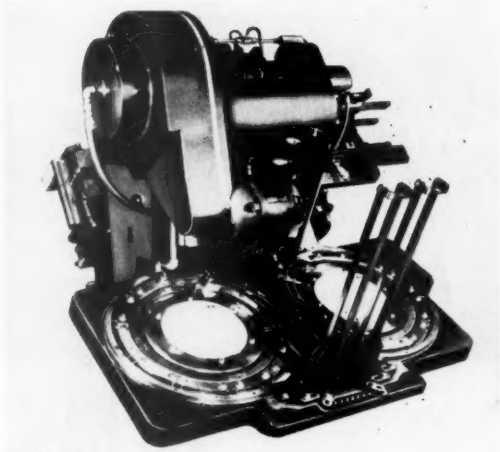


Fig. 2. In conjunction with the new strip feed press, also exhibited was a new automatic double-end curler used to curl can ends. The curler permits improved curling time for each can end. Larger curling wheels add to the curling time. The machine has extra heavy bearings and is equipped with an individual motor drive. It is adjustable to accommodate can ends ranging in size from 202 to 404. Chutes have electric detection devices to stop press and curler should ends back up in chute for any reason.

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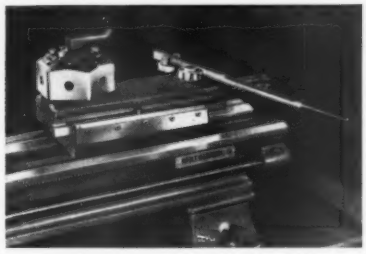
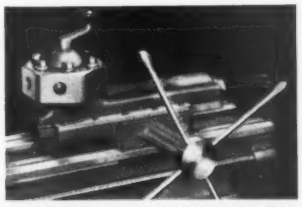


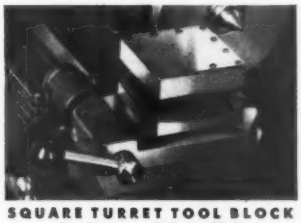
HANDLEVER BED TURRET
Indexes ± .0005" at 4". Superfinished index pin. Automatic indexing and feed stops. Effective slide feed 4".

Size Lathe	Catalog No.	Price
9"	CL1611N	$273.
Light Ten	CL1611K	280.
10"	CL1611R	286.
13"	CL1611T	308.



HAND FEED TURNSTILE BED TURRET
Indexes ± .0005" at 4". Automatic indexing and feed stops. 5⅞" feed.

Size Lathe	Catalog No.	Price
16"	CL1917H	$683.



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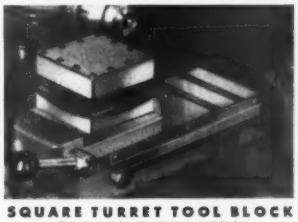

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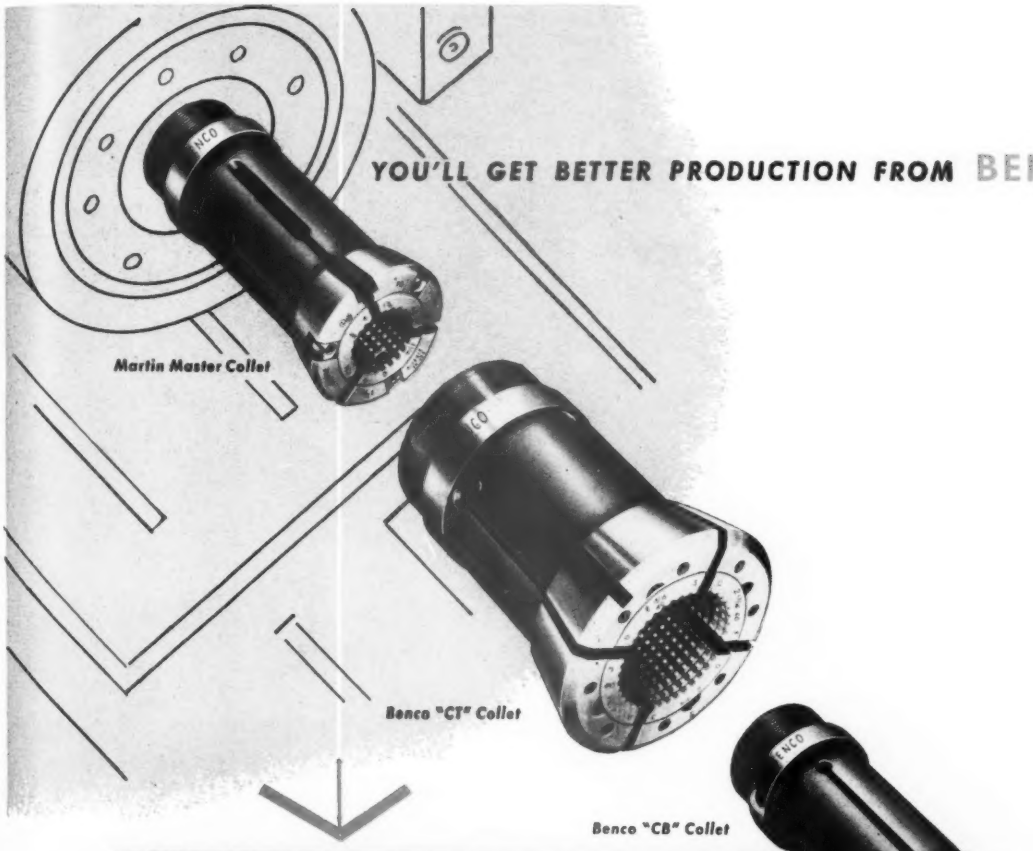

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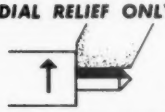

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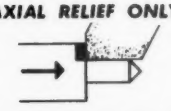

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